



FRIDAY, FEBRUARY 8, 1895.

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Contributions.

M. Stévant and the Lewis Valve Gear.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A letter has recently been received from M. Armand Stévant, of Liège, Belgium, calling attention to an article in the *Bulletin du Congrès des chemins de fer* upon the Lewis valve gear described and illustrated in your issue of April 27, 1894. Following a translation of your article it says:

It is not our custom to discuss questions of priority of invention, but impartiality obliges us to note that European engineers will wonder at the American author's claim of the Walschaert lever, known and used in Belgium for 40 years. In addition to this the device of actuating the valve of each cylinder from the cross head of the other side was in use more than 25 years ago on the Belgian State Railroad by Mr. Stévant, Chief of Bureau of Motive Power under Mr. A. Belpaire. This distribution was first constructed in 1870 for trains on the heavy grades of Liège, and was described at the time in most of the technical journals, *Revue universelle des mines*, *Annales des travaux publics de Belgique*, *Chronique des travaux publics*, *Engineer*, *Engineering*, etc., etc.

Mr. Couche has mentioned this gear in several places in his *Treatise on Railroads* adding rather an unjust criticism (Vol. III, pages 321 to 351, plate VI, Fig. 10) which has been copied by several authors, particularly Mr. Boulvin, in the *Annales de l'Association des ingénieurs sortis des écoles spéciales de Gand*.

A locomotive exhibited in 1873 at Vienna designed by Mr. Stévant also had this feature.

In sending the above communication Mr. Stévant adds that it is not a question of patent or money, but rather a case of "render unto Caesar the things that are Caesar's."

The writer of this begs to add that the report of the United States Commissioners to the Vienna Exhibition of 1873 makes no mention of Mr. Stévant's locomotive and it seems quite strange that in Mr. Sauvage's excellent little book on the locomotive no mention is made of this gear, nor does the writer ever remember having seen it noticed in European publications on valve gears.

Mr. Stévant does not know, of course, that an engineer by the name of Blanchard, as long ago as 1849, constructed a switching engine at Paterson, N. J., in which there were no eccentrics, the valves of each cylinder being actuated from the crosshead of its neighbor.

In all probability Mr. Lewis designed this gear without any knowledge that it had ever been used before. We think Mr. Stévant is at fault in stating that the American lays claim to the Walschaert lever. This lever has been used by several American builders for many years and Walschaert's name has been given to it. Unless the writer is mistaken Heusinger von Waldegg and not Walschaert was the inventor of this gear, which, if true, would show that Europeans sometimes claim inventions to which they are not entitled. See foot note on page 463 of Vol. II., of *Handbuch für Specielle Eisenbahn-Technik*, by Edmund Heusinger von Waldegg, Leipzig, 1875.

ENGINEER.

Speed Limits for Electric Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial, page 39, issue dated Jan. 18, "Speed Limits for Electric Street Cars," leads to these comments:

That regular and continuous rapid transit may be had by the substitution of electric or other motive power for horses on railroads over the surface of crowded city streets is a fallacy—practically denied by managers of such railroads electrically equipped, and overlooked by laymen as well as some engineers, but no less a mistaken assumption—which, for instance, in the neighboring city of Brooklyn by tending to reduce and perhaps, eliminate the profits of operation necessary to their extension, maintenance and successful working, will greatly retard the development of real rapid transit over its elevated lines.

Regulation of the speed of surface street cars on such streets and provision that it cannot exceed a certain low limit, and this independently of the discretion of motormen, or the cupidity of managers who will gage the pay

of employees by the number of round trips made, and thus tempt these men to make up by unduly increased speed time lost by common and unavoidable delays, is a humane and imperative necessity. Such regulation can be had by a simple appliance on each car, which when the speed limit is reached will shut off the electric current, and, if need be, apply the brakes. On cable street railroads, except when the car is going down grade and the grip is relaxed, perforce the speed is limited and the public does not complain.

The judgment of the motorman, no matter how discreet and competent he is, cannot avail in cases where the vehicle or person approaches the track from a cross street and is screened from the motorman's observation until an attempt at crossing is made, and then if the car is moving at high speed collision is unavoidable. To this fact the extraordinary mortality resulting from the operation of the street railroads in Brooklyn since electricity was substituted for horse-power, and their speed in overcrowded streets greatly increased, is largely due; that so many fatal accidents could possibly occur on city streets over which the pedestrian and driver have surely rights not less than the surface car, is not only in the judgment of the writer quite inexcusable but also of the courts, which are awarding in cases brought to trial large damages therefor.

AN IMPERILLED PEDESTRIAN.

Long Freight Cars with Weak Frames.

BUFFALO, N. Y., Feb. 2, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just read your article on the proposition now being considered by the trunk lines and other railroads to limit the size of freight cars. In general I agree with your position. There is no use in trying to keep the railroads which do business in Grand Rapids from making furniture cars as big as they can make them and get connecting roads to accept them; and a railroad carrying large quantities of granite or iron or other heavy material should have the privilege of loading its axles with 10 or even 15 tons apiece if it finds it safe and profitable to do so. If a freight agent likes to carry mattresses and corks at the same rate per 100 lbs. that he carries hardware and sugar that is simply his own foolishness or viciousness and the traffic men should work out their own remedy.

But at the same time I do not know but the operating officers will have to compromise with the traffic men a little. We need their assistance, and perhaps we shall have to assist them more or less in return. The man who builds cars which are extremely inconvenient to handle and at the same time are an annoyance to the traffic officer who wishes to maintain reasonable rates has a variety of tricks by which to attack the railroads. I will mention only one, that of the man who builds a platform car as long as he dares to, and takes no pains to stiffen the frame. I have seen such cars, made to carry street cars upon, which were 62 ft. long, with a floor hardly stiff enough for a 34-ft. car. The builder, if he had any conscience at all, assumed, in the guileless simplicity of his heart, that we could always run his cars on the rear end of the train, and, of course, he would find some traffic officer on a poverty-stricken road who would agree to carry all the trolley cars such a flat would hold and bill them as 24,000 lbs., first-class. But in point of fact, as I hardly need tell you, such cars cannot well be kept at the rear of the train; even if you try to thus place them they will get into the middle or front portion of long trains, and the first you know a sudden application of air brakes will crowd such a car so hard as to crush the frame and wreck the train.

It is bad enough to have to look out for dangers that are inevitable. In such a case as this, I think we ought to get all the assistance possible from the traffic department to aid us in discouraging the construction of such cars. If the important systems, like the older trunk lines, will refuse to haul these cars built so much longer than there is any necessity for we may hope that their action will stiffen the minds of some of the traffic officers on rate-cutting roads so that after a time we shall have proper restrictions on all roads. Let them build cars as wide and as high as they can, provided they will not force them upon their neighbors, and let us hope that the rates charged will be in reasonable proportion to the space provided. But when it comes to enlarging the third dimension, length, it is time to call a halt.

SUPERINTENDENT.

The Systematic Improvement of the Lake Shore & Michigan Southern Railway.

BY BENJAMIN REECE, M. AM. SOC. C. E.

[We have long wished to give the story of the systematic improvement of the line and grade, and especially the grade, of the Lake Shore & Michigan Southern Railway, which has been followed out so persistently and minutely for many years. While Mr. Newell was always ready to talk privately about the work, he was never willing that any detailed account of it should be published. Not a great while before his death he put into our hands a complete set of blue-prints of the profiles of the road, showing the old and new grades; and about that time we were able to enlist the interest of Mr. Reece in writing the following account of a work with much of which he was personally familiar, having been for 17 years in the Civil Engineering Department of the system.—EDITOR RAILROAD GAZETTE.]

The Lake Shore & Michigan Southern Railway came into existence in the year 1869; prior to that time the

lines of that system lying west of Toledo, now called the Michigan Southern Division, constituted the Michigan Southern & Northern Indiana Railroad, which was itself an outgrowth of an earlier union of the Michigan Southern, the Northern Indiana, and the Erie & Kalamazoo Railroad. The portion of the system lying east of Toledo, now called the Lake Shore Division, consisted at that time of three distinct corporations, severally known as the Buffalo & Erie, the Cleveland, Painesville & Ashtabula and the Cleveland & Toledo railroads. In the early part of 1869 the two last named properties were amalgamated into the Lake Shore Railway, while in May of the same year the lines both east and west of Toledo were consolidated into the one system, under its present name.

From the consolidation dates the beginning of a period of improvement and development during which the main line was double tracked for 208 miles, from Buffalo to Elyria, the lines now constituting the Franklin Division extending southerly from Ashtabula were constructed, while the abandoned line from Sandusky west to Milbury, and the new branch line extending from Jonesville to Lansing, Michigan, were both completed. Large freight yards, in some instances combined with extensive shops, were constructed at 43d street, Chicago; Elkhart, Indiana; Air Line Junction, near Toledo, and at Col'ingwood, east of Cleveland; large additions made to existing yards, and many long passing-sidings were built along the line.

Further extensive betterments and additions were in contemplation or in progress, among which may be mentioned the construction of a second track for 101 miles between Elkhart and Chicago, and the complete re-arrangement of the Toledo yards. A site was selected, and the ground was in preparation for the erection of a new passenger station at Toledo, designed to avoid the delays and interruptions to yard work caused by the backing in and out of the old Island House station, by all passenger trains; arch masonry was being built to replace the wooden structures bridging the smaller streams, and many minor improvements at various points along the line were fairly under way, when the death of Mr. Horace P. Clark, President of the Company, and the financial revolution of 1873 led to their sudden and complete abandonment, and a policy of vigorous economy and retrenchment was at once inaugurated.

Commodore Vanderbilt succeeded to the presidency of the road, and, in the fifth annual report, for 1874, he thus describes the precarious state in which he found the finances of the Company:

"When I was elected your President, July 1, 1873, I found the financial condition of this company to be as follows: Capital stock, \$50,000,000, all issued; funded debt, \$29,730,000; floating debt, \$6,277,485; including a dividend due August 1, \$2,004,315, and bills and payrolls for June, \$1,478,686.

"There was not a dollar in the treasury. Contracts for construction, equipment, 20,000 tons steel rail, etc., to the amount of \$7,894,845, had been made, and the work all commenced, with no provision whatever for meeting the large payments.

"The panic of 1873 occurred in September, and disclosed the fact that the entire dividend just paid (\$2,004,315) had been borrowed, on call, of the Union Trust Company. That institution closed and passed into the hands of a Receiver, who called this large loan at a time when money could not be borrowed on the best collateral security. After giving the Trust Company ample security of my own for this debt, thus saving the road from bankruptcy, I undertook to extricate the Company from its financial difficulties.

"The contract for building the second track from Elkhart to Chicago, one hundred miles, had been let, and work commenced. This contract, amounting to \$1,500,000, was amicably cancelled without loss. Strenuous efforts were made to procure a release from other large contracts, but so much material had been purchased and work done, it was impossible, and they have all been fulfilled. At this time not a single contract involving the payment of money is outstanding. The money required to meet these obligations amounted to \$6,394,845."

The gross earnings of the road, which in 1873 had exceeded \$19,400,000, fell to \$17,140,000 in 1874, and continued to decrease, until in 1877 they dropped to the lowest point, the earnings for that year being only \$13,500,000, or nearly six millions less than in 1873.

Under such conditions strenuous efforts were made to reduce expenses, and from the observations made and experience gained during that gloomy period came the suggestion of those comprehensive improvements of the physical property of the Lake Shore, which were conceived, inaugurated and almost completed under the able management of its late President, Mr. John Newell.

From the first days of its existence the physical property of the road has been entirely in the hands of engineers, and the direction of its maintenance has been immediately under their control. With such distinguished members of the profession as Mr. Charles Faine for its General Superintendent, and Mr. Charles Collins for its Chief Engineer, it will create little surprise when it is stated that even as early as 1874 no reduction of forces or restriction of materials was permitted which in any way threatened to lower the standard of track condition which at that time prevailed. During the writer's 17 years' connection with the engineering department of the line, extending from 1871 to 1887, instructions to reduce expenses were more or less frequently received, but such orders would direct that no improvements be attempted, but that the property must be preserved and no deterioration in track condition would be tolerated. Being in this manner held to a strict accountability for the proper maintenance of the track, reductions in force and cuts in requisitions could not be indiscriminately made, and in order to minimize expenditures, those directing the work of renewals and repairs were compelled to give close attention to the details of organization and improved methods of

distant points. In the first case, a through track is laid alongside of each retort; the tank and machinery cars are then placed on tracks beyond or outside of these tracks, ties are received on flat cars, loaded thence on the retort trucks for treatment, passed through the retorts, and, on emergence at the further end of the retorts, are in position to unload on the same cars on which they were received; these flat cars having in the meantime been moved along the through tracks past the retorts to their new position for receiving loads. In this plan of working it is necessary to provide one empty flat car with every four loaded cars when received at the works, as the increased weight of ties by treatment necessitates the loading of fewer per car.

In the second case, it is not necessary to run the tracks through the works, as the ties are, in the main, received on flat cars and loaded for distribution in box cars, so that both loaded and unloaded cars are switched in on their respective tracks and afterwards pulled out in the direction from which the cars come.

In both cases a slight grade is given to the loading and unloading tracks in such direction as is most convenient for moving the cars by hand without necessitating the continuous use of a locomotive at the works.

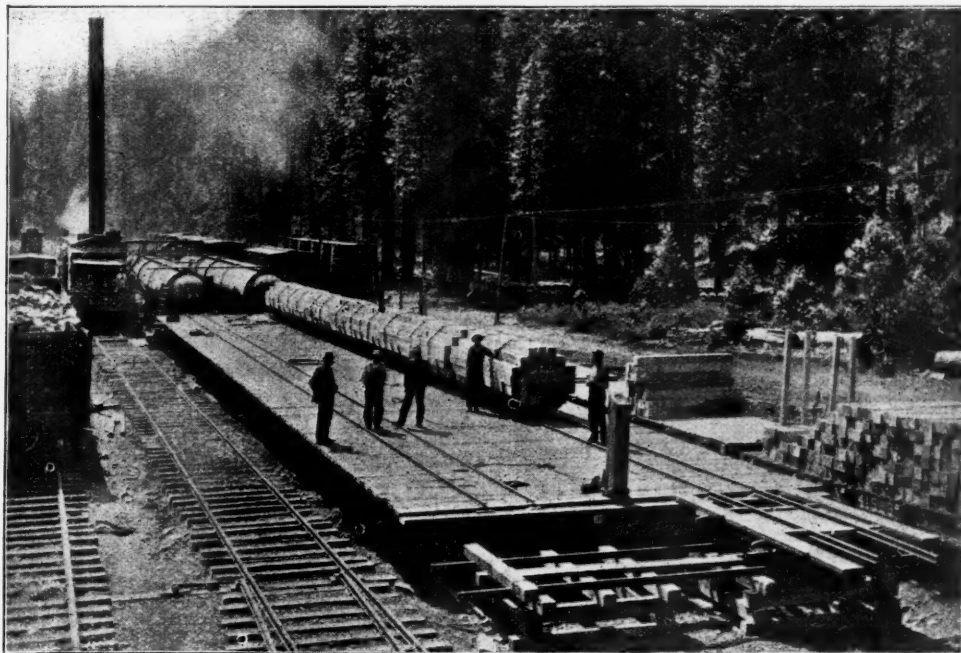
Setting Up.—The ground tracks and foundations (made of tie blocking), having been prepared for the reception of the plant, the retorts are run into position, lined up and adjusted to height by jackscrews, which form part of the tracks supporting the retorts; the trucks are then blocked up with steel wedges so as to take the weight off the springs, and the trucks at the center joint are blocked lengthwise. The end trucks are free to move endwise, so as to act as expansion rollers. The middle connection between the halves of each retort is then made, the tank and machinery cars are run into position and pipe connections made. All large pipe connections between machinery cars, tank cars, and the retorts are made with ball and expansion joints; the latter allow a play of some four feet, so that inequalities of track, both in height and distance, are provided for. The smokestack is raised with a gin pole and guyed; the winch is placed in and below one of the end platforms and between the treating tracks, so that the engineer can see the charge as he works the winch. The wire cable for handling the charges is run under the platforms, from the winch to a snatch-block at each end of the platforms, thence it returns on top of each platform.

Process of Charging and Handling Ties.—The ties received at the works are placed on tracks adjoining the retort platforms and are thence transferred directly to the retort trucks, being laid thereon in bunches cylindrical in form, bound together and to the trucks by small chains, "sticking" pieces of iron, one-quarter to three-eighths of an inch thick, being placed between each layer of ties. Two ropes called "pennants" are strung under the charge. These are wire ropes, having an eye in each end, and are a little longer than a charge of ties. One end of a pennant is fastened to the foremost truck and one end of the other is fastened to the hindmost truck; the back rope from the winch is fastened to the former and the pulling

the same as that of a charge of ties (14 lengths), it is necessary for the engineer to place the charge quite accurately. The object of the connection with the back rope from the winch is to enable the engineer to reverse and pull the charge slightly back in case it overruns, as occasionally happens, or to stop the load accurately by brake-

Second: A preliminary vacuum is begun; this is run up to about twenty inches. During this vacuum the doors are bolted up tightly. This vacuum process requires about ten minutes.

Third: Live steam is let in at about thirty pounds pressure and continued for about four hours and a half.



Southern Pacific Wood-Preserving Plant.

ing the back line. The charge having been run into the retort, the winch lines are unhooked from the pennants, and the ends of the latter thrown under the charge. The doors of the retorts are now closed and screwed up by hand wrenches. On the first screwing up of the retorts not much trouble is taken to get them quite tight, as this

It is then blown off requiring half an hour. During this steaming and blowing off the retorts are drained.

Fourth: A second vacuum is created, of from 22 to 26 inches, which is maintained for about an hour.

Fifth: The retort is filled with the zinc chloride solution and pressure begun. This is continued until the required quantity of solution is injected into the ties.

Sixth: The surplus preservative fluid is drawn off, the doors opened, and the charge pulled out on the platform. Another charge, which has in the meantime been made ready, is immediately pulled into the same retort to undergo the same process. The treated ties are unloaded on to adjoining cars, the trucks pushed to a small transfer table at the end of the platform, transferred to the opposite track of the same platform and loaded with fresh ties to be run into the other retort for treatment. Trucks sufficient for three charges of ties are used.

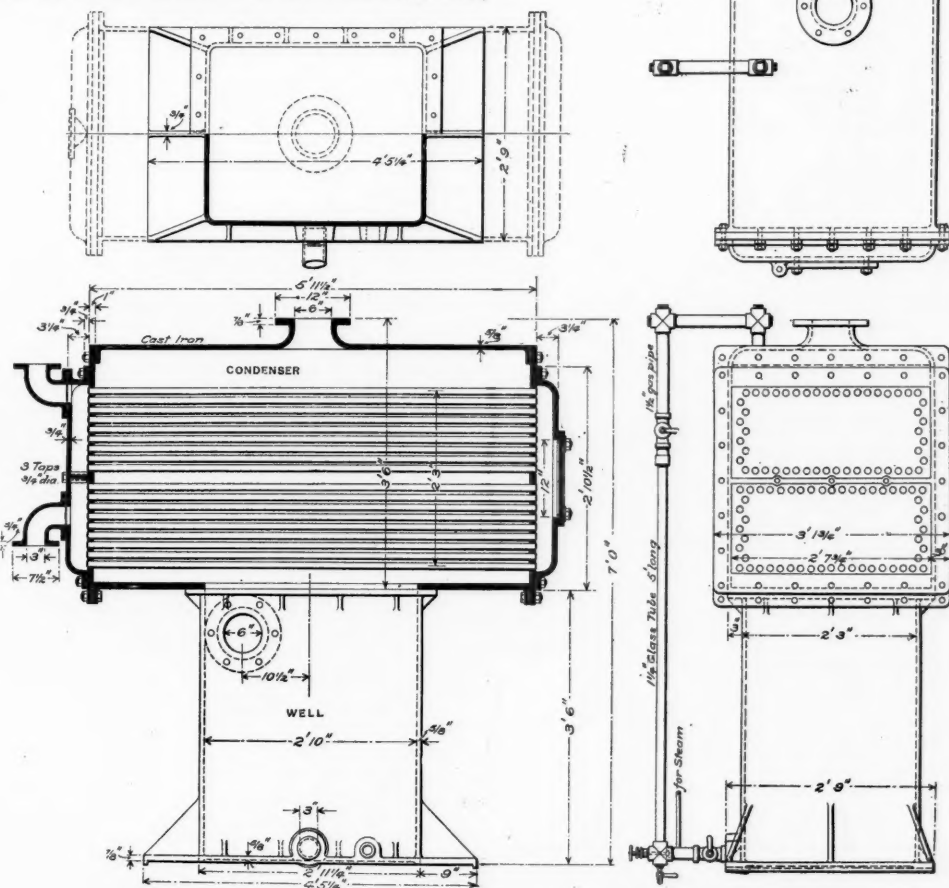
In steaming, live steam at a temperature of about 260 degrees F. is used, corresponding to a gage pressure of about 20 pounds. Preservative fluid is injected at a temperature of about 150 degrees F. A maximum pressure of about 140 pounds is allowed in injection; with freshly cut ties, however, 120 pounds is not usually exceeded.

The total time of treatment averages about eight hours and a half, and, as the retorts are run nearly alternately, we get from noon one day to noon the following day five charges treated, or a total of 2,520 ties, 7 in. x 8 in. x 8 ft. per day of 24 hours. If, however, all the ties are new or freshly cut the time is reduced so as to get out six charges per day, or 3,024 ties in all per day of 24 hours.

We find the time required varies greatly with the kind of timber and with the time during which the ties have been seasoning. California mountain pine, fir and spruce require less time than Oregon fir, and all timbers are more readily treated when freshly cut. An Oregon fir tie, seasoned in the air for two years, will take double the time for the treatment required for one freshly cut. Occasionally a close-grained, well-seasoned tie will not receive the preservative at all, the fluid penetrating into the sides only about half an inch.

Much attention has been given to this plant to provide means of watching the effect of the various steps in the process, so as to vary the treatment as the timber requires it. The retorts are provided with thermometers, the steam pipes with a pyrometer, and all tanks with gages; the condenser is provided with a measuring well, all injection is from a gaged measuring tank, and sample ties are tested and reported from each batch, as noted further on. The principal blanks used for these and other reports are appended hereto. The condensing apparatus consists of one set of ordinary surface condensers (connected to the vacuum pipe, and between the retorts and air pump), which is over and supported upon a measuring well, into which all condensed saps and vapors flow, thus preserving a constant surface for condensation. The measuring well is provided with a glass gage, and is of such dimensions that each foot of the glass gage represents one-fourth of a pound of water extracted per cubic foot of timber. This well is so arranged that it can be emptied without stopping the air pump. By this means any desired dryness of the timber may be accomplished with certainty. In the practical operation for the treatment of ties the extraction of moisture is stopped when the rate, as shown by the condenser gage, is reduced to one pound of water per cubic foot per hour.

Mixing the Fluid for Use.—Concentrated solution of zinc chloride, called "stock solution," as formerly pur-



Surface Condenser for Portable Wood Preserving Plant—Southern Pacific Company.

rope to the latter, so that the charge is hauled into the retorts by pulling on the hindmost truck, which pushes those ahead into the retort. The object of this is to dispense with couplings between trucks, and so economize room in the retorts. As the length of the retort is about

can be better done later on when the vacuum is started in the retort.

Method of Burnettizing Treatment for Railroad Ties.—First: The charge is run in and the heads or doors closed and bolted up.

chased and now manufactured at the works, consists of about 43 per cent. pure zinc chloride, 2 per cent. of impurities (iron, aluminum, lead, etc.), and 55 per cent. of water. This is weighed out and mixed in a small lump, with a proper proportion of water, thence pumped into the wooden supply tanks, tested with a Beaumé hydrometer, and, if necessary, a slight addition of either stock

sheet and about 18 inches at the extreme back end, as shown by Fig. 1. With this arrangement a trip was made from Philadelphia to Perkiomen Junction, 25.7 miles on the Philadelphia & Reading railroad hauling a regular train. The engine not only burned the petroleum without smoke, but steamed very freely, the only drawback being that on account of frequent stoppages it could not be

ditions of service. With compound engines a safe rule would be to allow 1 inch for each 600 sq. ft. of heating surface. The firebox should be as large as possible when new engines are built, allowing ample room for mixing of the air and vaporized oil. The supply pipe leading to the burner should be not less than 1 inch diameter. The steam jet should be made for a 3/4-in. pipe, and the supply can, of course, be regulated by means of a stop valve. A strong blower is very necessary, oil requiring a sharper draft than soft coal. A 1-in. iron pipe is suggested on engines with 15-in. cylinders and over, and 3/4-in. pipe on smaller engines.

It is desirable at times to have a very small supply of oil for the burner, especially when standing still at stations or drifting down grade, and in order to accomplish this the passage way through the cock regulating the oil supply is made square and diagonal with the center line of the plug. Then the opening to the cock will always

BURNETTIZING ON THE SOUTHERN PACIFIC RAILROAD—TABLE OF PROPORTIONAL PARTS.

Gallons Standard Solution=1.7 per cent. Zn Cl ₂	1.00	2.984	6.94	14.492	13.038	12.979	4.144	4.5	5.25	1.686
Pounds Stock Solution=43 per cent. Zn Cl ₂	0.335	1.	2.326	4.856	4.369	4.349	1.389	1.508	1.759	0.565
" Pure Zinc Chloride=Zn Cl ₂	0.144	0.43	1.	2.088	1.879	1.87	0.597	0.648	0.757	0.243
" Pure Metallic Zinc=Zn.....	0.069	0.206	0.479	1.	0.9	0.896	0.286	0.311	0.362	0.116
" Zinc Dross or Skimmings=90 per cent. Zn.....	0.077	0.229	0.532	1.111	1.	0.995	0.318	0.345	0.403	0.129
" Pure Hydrochloric Acid Gas=HCL.....	0.077	0.23	0.536	1.118	1.006	1.	0.32	0.347	0.405	0.13
" Commercial Muriatic Acid=32 per cent. HCL.....	0.241	0.719	1.675	3.494	3.144	3.125	1.	1.086	1.267	0.407
Number of Ties, 6"x8"x8'.....	0.22	0.663	1.542	3.22	2.897	2.884	0.921	1.	1.165	0.375
" 7"x8"x8'.....	0.19	0.568	1.321	2.759	2.482	2.471	0.789	0.858	1.	0.321
Cubic Feet of Timber.....	0.593	1.768	4.112	8.587	7.725	7.591	2.455	2 3/4	3 1/2	1.

Standard Solution.. 2 1/2° Beaumé. 1 1/10 per cent. Zinc Chloride. 1.017 Specific Gravity. 8.472 Weight per Gallon. 14,000 Gallons Reserve.

or water added, so that the liquid for use, called "standard solution," registers 2 1/2 degrees Beaumé at 60 degrees F. The theoretical proportions for the desired standard solution, containing 1 1/10 per cent. pure zinc chloride, are 34.46 pounds stock of 43 per cent. zinc chloride to 100 gallons of pure water; but as there is much evaporation during the process the tendency of the standard solution is always to get stronger, so that, on a continuous run, there is added a certain proportion of water to allow for evaporation, or, what is the same thing, to reduce the quantity of zinc chloride to the gallon of water. Experience has taught us that about 27 pounds of zinc chloride stock solution per 100 gallons of water will keep our reserve solution (amount always in the supply tanks) together with that added for daily solution, up to standard; but this is carefully watched and additions made one way or the other, as the case demands, so that the standard, when injected into the ties, is always 1 1/10 per cent. strong. The standard solution is heated to 156 degrees F. by turning steam through coils in bottom of tanks before being pumped into the charge.

(Continued on page 89.)

Recent Experiments With Oil Fuel.

We have just received from the Baldwin Locomotive Works a pamphlet containing a statement of the results of some experiments in burning oil on a compound locomotive of the Vauclain type built by those works. The long and successful use of fuel oil by Mr. Utrihart on the railroads of Southeastern Russia and the exhaustive experiments in 1887 by the Pennsylvania Railroad did not furnish the precise sort of data required for present practice; that is, those experiments were made with locomotives of a smaller size than must be used for heavy service in this country, and it was thought desirable to select for the present experiments a locomotive with a long, narrow firebox representing the least favorable type that would be likely to be found. The possibility of making a locomotive of this sort steam well with petroleum fuel was in considerable doubt. We suppose that the special occasion for those experiments was the fitting of locomotives for oil fuel for service in Southern California, a brief notice of which we have recently published.

Three sets of tests were made, with the firebox arranged

tested for endurance; it was therefore decided to take a heavy train through to Baltimore.

For the second arrangement of the firebox the exhaust thimbles were reduced 1/4 in. to sharpen the exhaust and one brick added to the arch in the front end of the firebox; 10 inches of bricks were also removed from the bottom of the firebox at the back end and all of the brick arch over the fire-door, Fig. 2; this arrangement gave better results and it was determined to make another test of endurance, taking on Nov. 18 a train of 30 cars loaded with merchandise from Wayne Junction to Bound Brook, 54.9 miles. Greater endurance was found at high speeds. The approximate weight of this train was 563 tons. An average steam pressure of 171 lbs. was maintained during the run.

For the third arrangement it was determined to place the burner below the fire-door, attaching it to the mud-ring of the firebox, allowing it to spray at an angle upward and into the firebox. The brick arch was lowered, giving more area between it and the crown sheet. The bricks in the bottom of the firebox were also removed, and a number of the grate-bars replaced, and covered with fire bricks. A fire-brick hearth was made under the burner to catch any oil that might drop from it. The exact arrangement is shown by Fig. 3. A preliminary trial between Wayne Junction and Jenkintown, 5.8 miles, demonstrated this last arrangement to be the best of all, as far as endurance is concerned; so the series of experiments was closed by another through trip on Nov. 25 from Wayne Junction to Port Reading, 52.3 miles, hauling 27 cars—all but one loaded with coal. This train weighed approximately 661 tons. The average steam pressure was 170 lbs.

The results of these three trips are shown in the accompanying table, those in column A being the results using the firebox with the first arrangement, and in columns B and C those of the second and third arrangements respectively. On the first trip, using the first arrangement, two trains were hauled, one from Philadelphia to East Junction, 25.7 miles, 25 loaded cars, the train weighing approximately 724 gross tons; the second from East Junction to Canton, 64 miles, 20 loaded cars, weighing approximately 584 tons. With the first of these trains 2,435 lbs. of oil were used; with the second, 4,202. The weight of water evaporated for first train was 26,840 lbs.; for second, 44,043. Following is the table of results for the three different tests.

RESULTS WITH FUEL OIL ON COMPOUND LOCOMOTIVE NO. 82.

	A.	B.	C.
	Lbs.	Lbs.	Lbs.
Fuel.			
Oil actually used.....	6,637	3,200.7	3,703.0
Oil consumed per hour on run.....	1,003.2	1,086.9	1,110.9
Water.			
Total weight evaporated on run.....	70,933	34,151.7	39,169.2
Equivalent weight evaporated from and at 212° F.....	85,622	41,465.1	46,291.6
Equivalent weight evaporated per hour from and at 212° F.....	13,280	14,082.2	13,887.5
Equivalent total heat units derived from fuel. B.T.U.....	82,685,600	40,042,868.3	44,703,807.9
Economic Evaporation.			
Water evaporated per sq. ft. of oil.....	10.69	10.67	10.58
Equivalent evaporated per lb. of oil from and at 212° F.....	12.90	12.95	12.50
Rate of Combustion.			
Oil burned, per sq. ft., of grate surface.....	2.37	114.32	132.25
Oil burned, per hour, per sq. ft. of grate surface.....	38.3	38.82	39.68
Oil burned, per sq. ft. of heating surface.....	3.13	.....	.....
Oil burned, per hour, per sq. ft. of heating surface.....	.49	.....	.....
Rate of Evaporation.			
Water evaporated, per sq. ft. of heating surface.....	33.47	16.12	18.48
Water evaporated, per hour, per sq. ft. of heating surface.....	5.19	5.48	5.54
Equivalent per hour, per sq. ft. of heating surface.....	.....	6.64	6.55

The third arrangement was decidedly the most satisfactory, as is seen from the table. It will be noticed that the evaporation of the oil was practically the same on all three trips. More oil was consumed per sq. ft. of grate surface on trip No. 3.

The burner used was of the smallest size, which proved large enough for all purposes. A somewhat larger burner is suggested, giving surplus width of opening, since the oils used may vary greatly in value. A width of 1 inch for each 100 sq. in. area of cylinder would meet all con-

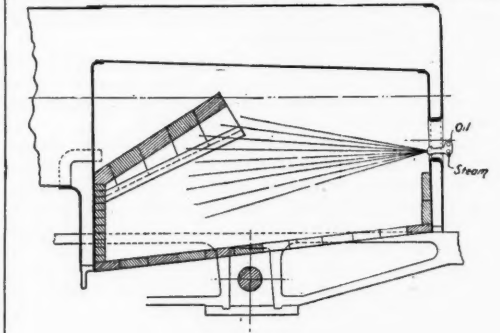


Fig. 2.

be a square no matter how small it may be made, and will not be so easily stopped shut by refuse in the oil.

In order to protect the firebox from the rapid circulation of cold air through the tubes and loss of heat from that cause the ash-pan should be fitted with a strong cast iron frame as large as possible at its back with its surface machined and fitted with an air-tight damper, operated by a good strong shaft or lever, something that will stand a little rough usage; this will enable the fireman to close the ash-pan air-tight, or practically so.

The levers for operating and adjusting the blower, oil supply, and steam-jet should be placed inside the cab and close at hand to the fireman's seat-box, so he may be able to remain seated, giving him nothing to do but to watch for signals on the line, and at the same time observe closely the movements of the engineer and adjust the supply of oil accordingly.

There are several advantages in using oil instead of coal; viz., no smoke (if carefully fired), no sparks, no terminal labor, such as cleaning fires, hauling away ashes, and loading coal, which is quite an item on some roads. This labor in some cases amounts to 50 cents for every ton of coal burned, and should be taken into consideration when comparing cost. Another great advantage is that the locomotive is always ready for work, the fire is always clean, no danger of its being torn up by heavy exhausting or by the engine slipping. Oil is certainly an ideal fuel, provided its cost will not prevent its use.

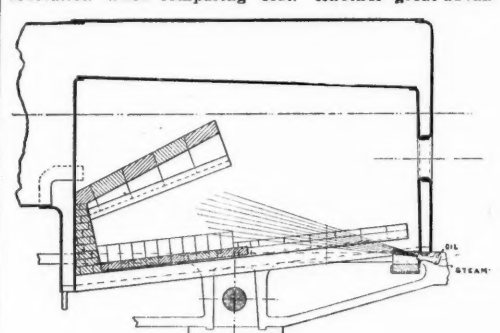


Fig. 3.

The results are based upon an 88 gravity oil. After testing it was found to be only 84, which would have made the figures somewhat better.

Tests of Melan and Other Arches.

Some interesting tests of Melan and other arches for floors of buildings and bridges were made in New York City on Jan. 25, by Mr. Geo. Hill, Am. Soc. M. E., the results of which are given below.

Uniform spans of 6 ft. were used, and all loads were center loads.

A hollow tile arch was the first tested, built of 10-in. blocks, and 3/4-in. webs. With a center load of 10,500 lbs., equivalent to 800 lbs. per sq. ft. if equally distributed, breaking occurred. The deflection was not recorded.

For the second test, with the same tile section, but with the ribs arranged in the style termed "Austria," with a 6-in. rise, a center load of 20,500 lbs. caused a deflection of 0.4 in. before breaking occurred. This load represents 1,600 lbs. per sq. ft. equally distributed.

For the third test, a steel and concrete light Melan arch, 6 ft. span, 8-in. rise, built of 3 in. x 3 in., 6.6 lb. T's 2 ft. apart and 3 in. of concrete, deflected 0.45 in. under 40,000 lbs. concentrated on center rib, but did not collapse when a tie rod was sheared off. The arch carried

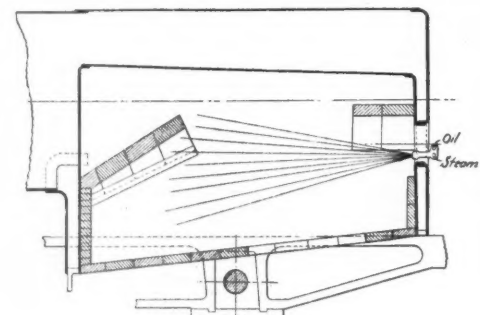


Fig. 1.

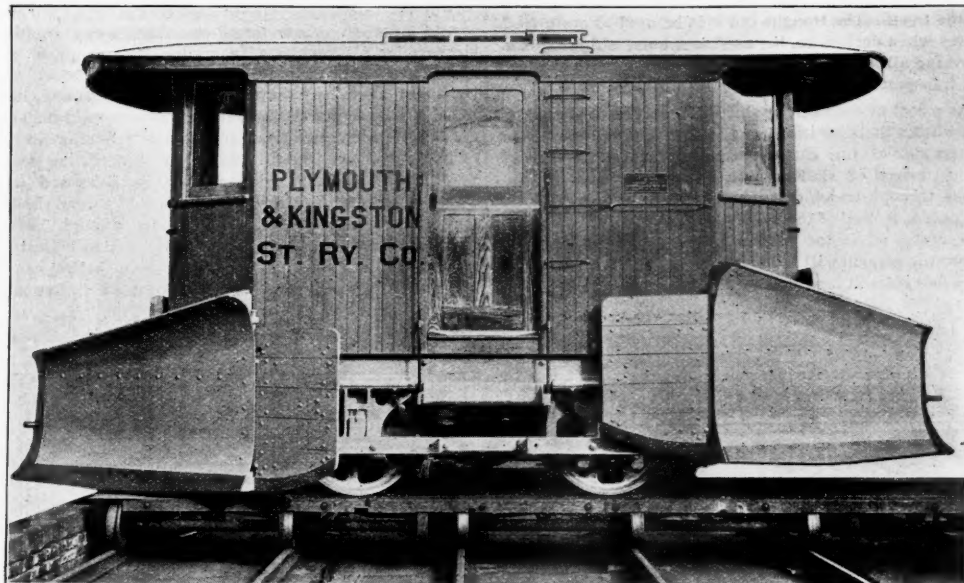
in three different ways, as shown in the cuts. The locomotive used, No. 82 compound, was of the following general dimensions:

Gage.....	4' 8 1/2"
Cylinders, { High pressure..... 14" diam. { 24" stroke.	
{ Low pressure..... 24" {	
Drivers.....	72"
Weight, total.....	133,300 pounds.
Weight on drivers.....	98,650 pounds.
Boiler, diameter.....	62"
Number of tubes.....	270
Diameter of tubes.....	2"
Length of tubes.....	14' 0"
Firebox, length.....	120 3/4"
Firebox, width.....	33 3/4"
Firebox, depth.....	Front, 73 1/2"; back, 56 1/2"
Heating surface, F. B.....	169.7 square feet.
Heating surface, tubes.....	1965.6 square feet.
Heating surface, total.....	2135.3 square feet.
Grate surface.....	27 square feet.
Water space.....	Sides and back 3", front 4"
Staying.....	Radial.
Truck wheels, diameter.....	33 1/4"
Truck journals.....	5" x 10"
Driving-wheel centers.....	66"
Driving axle journals.....	8" x 8 1/2"

The first arrangement was to place the burner in the fire-door hole with a brick arch built over the door hole inside the firebox. The grates were taken out and four inches of bricks placed next the side sheets the entire length of the box and at the ends; the bottom of the firebox was covered over about half-way back from the tube-

a second loading of 35,000 lbs. without breaking. The style of tie rod used prevented any possibility of screwing the arch tight before the test began.

The fourth arch tested, a 4 in. 7 lb. steel T rib with a 7 in. rise, and loaded 1 ft. 1½ in. to one side of the center line, broke at 14,500 lbs. after deflecting 0.89 in. There was no lateral deflection.



Electric Snow-Plow.

By the TAUNTON LOCOMOTIVE CO.; from the designs of MESSRS. DEAN & MAIN.

The last arch tested was a heavy Melan arch, with 4 in. 7 lb. ribs, 3 ft. apart in 4 in. of concrete. A load of 54,500 lbs. concentrated on center line midway between two ribs, caused a deflection of 0.45 in., at which point one clamp of the machine broke.

On removing the load half the deflection disappeared, and beyond a few hair cracks, no signs of breaking were visible. We give below a table of the safe live loads, according to these tests, and the dead loads to be used with them.

Type of Arch.	Dead Load		Breaking load divided for		Safe live load.
	Of arch in lbs.	Of whole floor in building in lbs.	Dead (safety factor 5) in lbs.	Live (safety factor 10) in lbs.	
Hollow tile.....	40	75	375	800	43
Austria.....	40	75	375	1,600	143
Light Melan.....	40	80	400	3,200	280
Heavy Melan.....	50	90	450	6,000	555
Do. with pavement	....	200	1,000	5,000	500

On Feb. 1 the heavy Melan arch, which broke the machine on Jan. 25, was again tested, and withstood 58,750 lbs., the manner of loading being the same. The part carrying this load was 6 ft. x 3 ft., the adjoining part of the arch having cracked away. Therefore this load corresponds to 2 x 58,750 lbs., distributed over 18 sq. ft., or 6,530 lbs. per sq. ft. for an approximate breaking load. At this point a tie-rod gave way. The last test on Feb. 1 of a similar arch also failed to give a final breaking load, the machine breaking at an eccentric load of 70,000 lbs. A concrete arch, without ribs, was tested and broke at 30,000 lbs., being the only test giving ultimate results. It is probable that these heavy Melan arches would carry considerable over 80,000 lbs. without breaking. Further tests will be made in the future under the direction of Mr. Hill and Mr. Von Emperger.

Snow Plow for Electric Railroads.

The engraving shows a new electric snow plow for single track electric lines, which possesses some novel features.

The connections between the plows and car frames consist of parallel links, which, for the sake of rigidity, are trussed together. This construction enables the plow bases to remain parallel to the track as the plows are raised and lowered.

The operating mechanism consists of a rack and pinion under the floor, the rack being connected by rods to a bell crank at each end for lifting the plow. There is a plow at each end, and one rises while the other is depressed. One plow balances the other, although provision is made for working each plow independently, if this should ever be desirable.

Inside the car body there is a spindle from the pinion referred to on which is mounted a hand-wheel. Near by are the brake handle and the electrical controller. At each end of the car, at the sides, are levers for raising and lowering the track "diggers," and for operating the wing plows, the latter being folded in and raised simultaneously, or extended and dropped simultaneously. The parts here mentioned are duplicated at each end of the car.

The whole structure is of great strength and heavy construction, being made suitable for the severest cross-coun-

try work and is equipped with two 50 or 60-horse-power motors. Each end of the car body is inclined so as to enter somewhat into the plow, and thus to shorten the structure. Incidentally this brings the operator so near the plow point as to enable him to observe the operation in the most satisfactory manner.

Eleven of these plows are in operation this winter, and

sion that takes place in the latter; and as the dead wire does not have to be moved by manual power, the weight upon it may be made as heavy as may be desired. If the dead wire should break, the signal would go to danger, the same as when the signal wire breaks. It will be seen that there need be no tension on the active wire except when the signal is being moved.

The selector is shown in Fig. 2. In this apparatus the pulling of the lever moves the double plate *AB* to the left and this operation pulls whichever one of the two hooks *CD* may at the time be engaged with the plate, and the corresponding signal is pulled off (to the clear position). When the lever is pushed home the signal wire is slackened by the action of the spiral spring *E*.

Fig. 3 shows how the selector works. The rods *G* and *H* are connected to two different switches. In the drawing the switch connected with *H* has been thrown off from the main track, thus lifting the hook *L* (which corresponds to *C* in Fig. 2), thus making it impossible for the attendant to clear the corresponding signal. The same principle is employed for more extensive interlocking. The manufacturers state that this apparatus can be furnished at low cost. It is simple in design and easy to keep in repair.

These devices have given perfect satisfaction to the officers of the Boston & Maine, and new ones are being constantly put in. The compensator has worked successfully on signals 2,500 ft. from the tower. They are made by the Lynam-Adams Signal Co. of Nashua, N. H.

Maine Railroad Commissioners' Report.

The Railroad Commissioners of Maine have issued the 36th annual report of the Board. It is for the year ending Nov. 30 and the statistics are for the year ending June 30 last. Mr. A. W. Wildes, who had been on the Board 32 years, died on Oct. 2, and the report contains a resolution testifying to his high character and amiable disposition. The present Commissioners are D. N. Mortland, B. F. Chadbourne and Frederic Danforth.

The length of railroad in Maine on June 30 was 1,516 miles, an increase of 117 miles over the previous year. The increase is made up chiefly of the Bangor & Aroostook. The length of street railway is 80 miles, being four miles more than in 1893. The body of the report is taken up largely with sketches of new railroad now under construction by four companies and with notes of inspection trips made over all the roads of the State. These are accompanied by full-page half-tone engravings showing some of the bridges. The Maine Central has erected a new bridge at Brunswick and a cut is shown of this and also of the light iron bridge which was displaced by the new one. Seven employees, 2 passengers and 11 other persons were killed, and 41 employees, 4 passengers and 17 other persons were injured during the year. None of the passengers were killed or injured in train accidents. The volume is a thick one, all the reports of the companies being printed in full.

North Carolina Railroad Commissioners' Report.

The Railroad Commissioners of North Carolina—J. W. Wilson, T. W. Mason and E. C. Beddingfield—have issued their fourth annual report. Like the last one, it is very brief, the report proper taking only three pages, though the volume contains the railroad laws, the freight tariffs established by the Commission, all the proceedings before the Board and the reports of the companies, filling up over 400 pages.

The report states that complaints against the railroads have been comparatively few and have mostly been adjusted without difficulty. The railroads have acted in a friendly spirit. The new railroad built during the year ending Dec. 31 amounted to 29 miles, but no less than 30

miles of track has been abandoned, 15 on the Cashie & Roanoke and 15 on the Jamesville & Washington. The property of the North Carolina Railroad is still partially exempt from taxation, but so far as all other railroads are concerned, the long standing exemptions have now been done away with. The authority of the Board over express companies has been disputed and the question taken to the courts. Legislation is asked to make it clear whether the determinations of the Commissioners, when not appealed from, in actions for the enforcement of penalties, are to be held conclusive. The Commissioners suggest that perhaps a law ought to be passed giving them additional power in the supervision of telegraph companies.

The Nicaragua Canal.

The House Committee has resolved to report the House Nicaragua Canal bill as a substitute for the bill which passed the Senate.

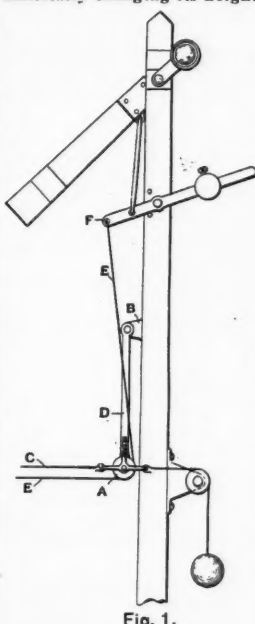


Fig. 1.

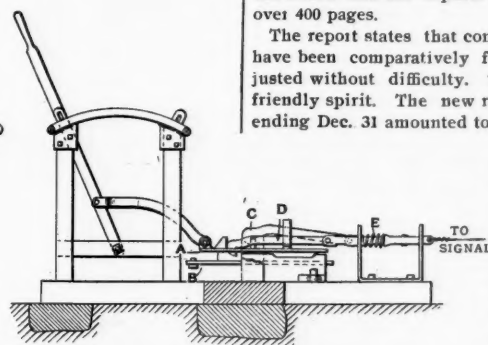


Fig. 2.

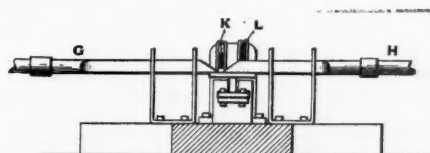


Fig. 3.

Lynam-Adams Signals.

action may take place in the length of the horizontal portion of the signal wire without raising or lowering the point *F* sufficiently to change the appearance of the signal. The apparatus provides perfectly for a variation in temperature of 100 degrees F. As the exposure of the dead wire to heat and cold is precisely the same as that of the active wires, it follows that the wheel *A* will always be moved at just the right time and in the right degree to accommodate any contraction or expan-

Campbell and House Combination Freight Car.

The car, illustrated by engravings from a detailed blue print and from photographs is designed as a combination stock, coal and merchandise car. It is the invention of Mr. R. B. Campbell, General Manager of the Baltimore & Ohio, and of Mr. F. E. House, Chief Engineer, Pittsburg & Lake Erie R. R. A 60,000-lb. car has been built after Mr. Campbell's designs and will be tried immediately on the Baltimore & Ohio Railroad. The material for our engravings was furnished to our representative in Baltimore by Mr. Grieves, Superintendent of the Car Department, and through his courtesy our representative saw the working of the different parts as the car was transformed from a box car to a stock car, and then to a coal or coke car. The change from one form to another was accomplished in a few minutes by two trainmen. The parts are all locked in position by throwing four levers, two on each side of the car. A padlock or seal will prevent unlocking during transit. The joints in the sides are beveled, forming a practically weather-tight joint, as shown in accompanying drawings.

The car is equipped with the Fox pressed steel truck,

car, and it is strong and durable when used for any class of freight, and is not an expensive car to keep in repair.

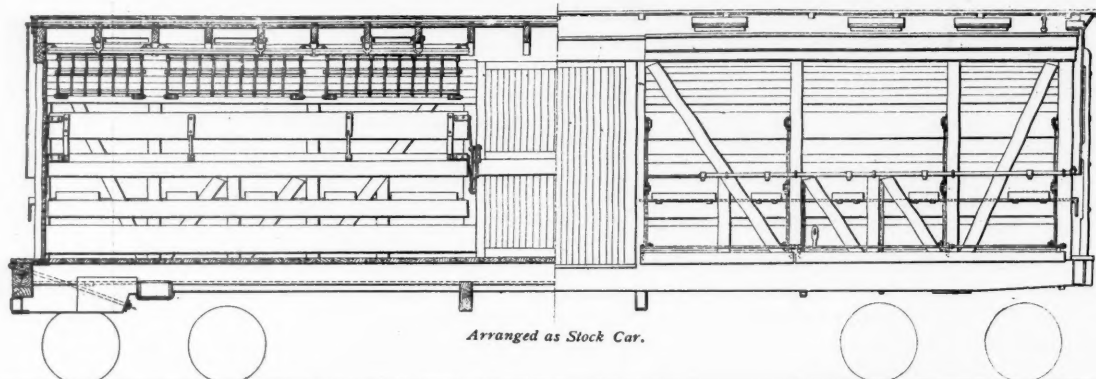
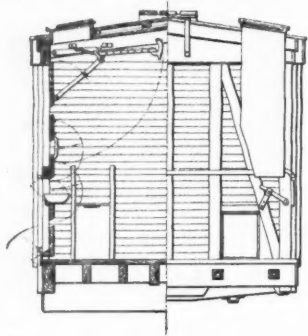
As a stock car, it is equipped with first class hay feed-racks with the necessary openings above, through which the hay is put into the racks; it has complete water troughs along each side, into which water is run from tanks placed at the end of the car. These tanks are so placed at each corner of the car that they can be filled from any position of the spout or hose from either side of the track. The troughs can also be used as grain feed-boxes when desired to be used as a horse shipping car, covering all necessary features to comply with the laws for transporting live stock.

As a coal or coke car, by shifting a portion of the slatted sides from their position as a stock car, the lower third of the side of the car (exclusive of the door) becomes tight instead of slatted, and the middle third becomes open, through which open portion coal can be loaded and unloaded, instead of the work being done entirely through the doors, as is the case with the ordinary box car. This arrangement will reduce the time and cost of handling coal and coke in loading and unloading.

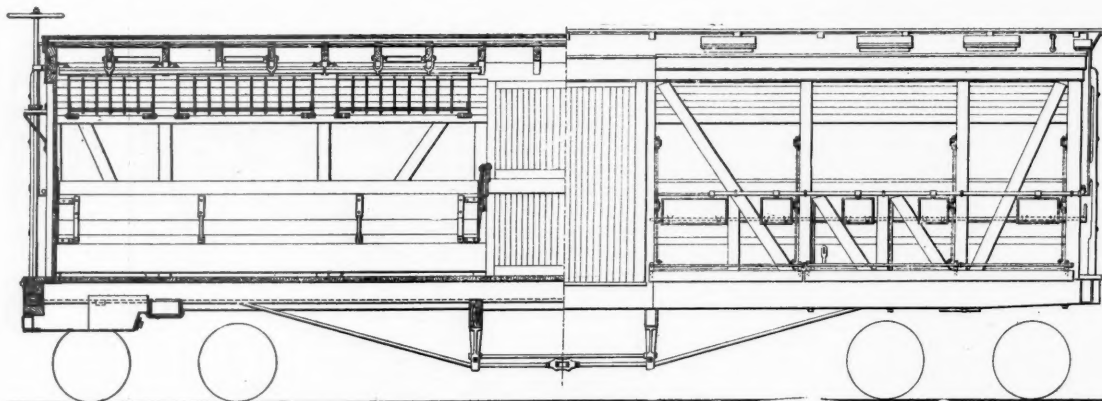
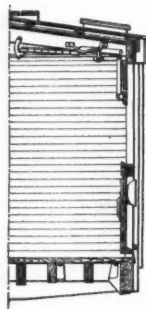
Railroad Matters in New South Wales.

The Railway Commissioners of New South Wales have issued under date of Nov. 19, a supplement to the annual reports of that body which we have had occasion to notice recently. This supplement is in the nature of a general summary of the work of the present commission.

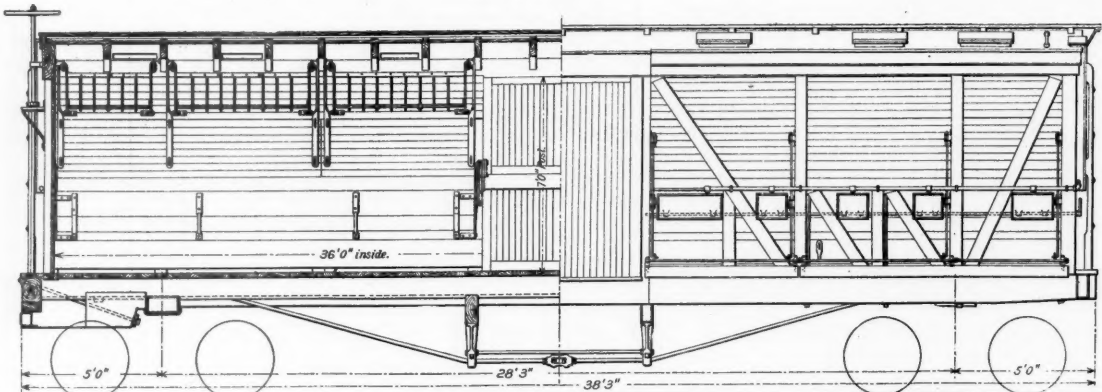
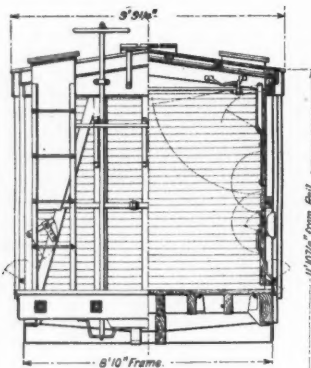
Maintenance of Way.—Under the head of maintenance of way the Commissioners say that it has been their policy to raise the character of the lines, using ironbark sleepers for all renewals, increasing the weight of rail and ballasting with bluestone or other hard rock. The trackmen have been supplied with tricycles and light hand cars, and the result of the improvement in material and in facilities has been a considerable reduction in cost of maintenance. The staff has been reduced, the saving in this respect being over £67,000, as compared with 1888, or 26 per cent. In new ballasting the Commissioners have found considerable economy through having purchased the right to use the Rodgers patent ballast car by which it is found that 72 cubic yards of ballast can be unloaded and spread over 250 yards of track in five min-



Arranged as Stock Car.



Arranged as Coal Car.



Arranged as Box Car.

Campbell and House Combination Freight and Stock Car.

with 33" wheels, 4 1/4" x 8" journals. The coupler is of the Buckeye type, with American draw bar. Westinghouse air brakes are provided.

The tanks at either end are connected outside by a pipe, so that two fillings only are necessary to fill the four tanks. The water from these tanks is piped to the feed troughs, which are turned down by means of levers at either end of the car. A bull-bar is provided for each door, and when not in use, is kept over the doorway, as shown in photographs.

After unloading at one terminus, a hose turned into the car will quickly clean it, so that timber, rails, or any of the coarser forms of merchandise can be loaded for the return. This car has been designed to overcome the present necessity of hauling cars empty, a large part of their earning lives being lost, for the reason that return loading often requires a different style of car from the one used to the point where the return loading originates. This car, as its name indicates, is equally adapted for use as a stock car, coal and coke car, or merchandise and grain car. The mechanical construction of the car is such that it can be readily changed into the different classes of

As a merchandise or box car.—When the car is arranged as a coal car, the lower third is tight and the middle third open, and the upper third is permanently closed as a backing for the feed-racks. To transpose it into a tight-sided car, appropriate side doors, swinging down from the roof, are so arranged as to exactly fill the open middle third, thereby making a weather-proof box car. These details have been so developed that the adjustable parts are easily and simply operated, and are entirely devoid of complication or weak construction.

Its value as an emigrants' movable car (in which trade at present ordinary box cars are used) will be readily seen. One end of the car can be made tight for the reception of the household goods while the other end can be arranged as a stock car for the stock. In stormy weather one side can be entirely closed and the other left open if desired. It can be tightly closed, so that a large majority of the commodities now carried in box cars can be handled in it. It can also be used for coarse grain by putting a batten on the floor. End doors provide for the loading and unloading of steel rails, long timber or lumber.

utes by two men. Under the ordinary system this work would take 24 men an hour to an hour and a half.

Cheap Lines.—In certain particulars, especially in the matter of buildings, the Commissioners have relaxed the requirements of the lines of small traffic, thus effecting a considerable economy. They have advised and still advise for very light lines a special standard of construction, building lines on which ordinary rolling stock can run, with a light locomotive, at about 15 miles an hour, in daylight only. These lines should be built, exclusive of bridges and stations, for about \$8,500 a mile. They would be pioneer railroads. Being of standard gage they would "avoid the great disadvantage of break of gage" and would cost scarcely anything more in the first instance than a narrow gage line. The whole of the ordinary rolling stock, except engines, which latter could be selected from the lightest types in service on the main lines, could run over these light lines. This is precisely the argument that we have lately advanced in writing on this subject. The Commissioners warn the colony, however, against undue extension.

Locomotives.—When the Commissioners took office they

found that the lines had been built with an enormous proportion of steep grades. There were 631 miles of grade varying from 176 ft. to 70 ft. per mile, and the worst grades were on the trunk lines and so situated that the whole volume of traffic had to pass over them. The Commissioners therefore decided upon reducing some of these grades, and upon introducing more powerful locomotives. The result has been a saving per annum estimated at more than £100,000. The mileage of trains and of assistant engines has been greatly reduced. The great reduction of trains has this other advantage that it has postponed for many years double tracking of the great mileage of single track.

engraving of this with dimensions. The drivers and cylinders are of the same dimensions as the Baldwin consolidation, the total heating surface is nearly 250 ft. more, and the grate area somewhat less. The weight in working order is almost precisely the same and the Commissioners do not expect any greater tractive power from the new engine. The Baldwin engine takes a train of 350 tons up a grade of 157 ft. at 10 miles an hour and a train of 650 tons up a grade of 35 ft. at 18 miles an hour. The same performance is expected of the new consolidation engine. The heavy engines were first put to work in 1891, and the train mile earnings have been increased and expenses decreased to such a degree that the net earnings per train

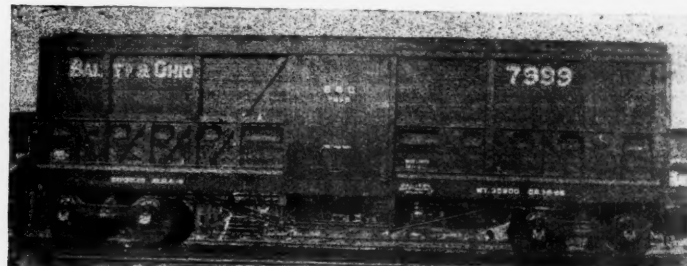
city of 10 tons. The weight of these is 5 tons 16 hundred weight.

These instances will give a fair notion of the direction and amount of improvements made in the physical condition of the property under the Commissioners. The results in earnings and in reduced rates we have repeatedly referred to. Gross and net earnings have greatly increased, and rates have materially declined.

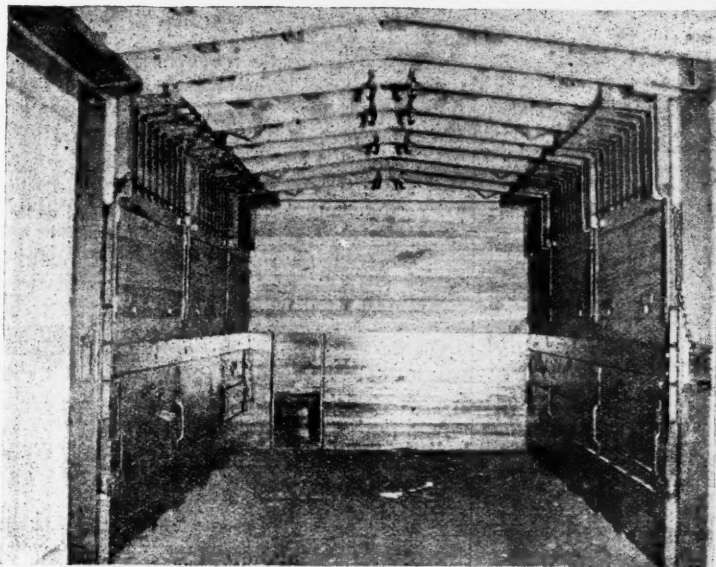
The Commissioners appear also to have worked steadily and intelligently for the improvement of the condition of the staff in all grades, have paid liberal wages, have made careful arrangements for the comfort and convenience of the people employed and introduced in 1890



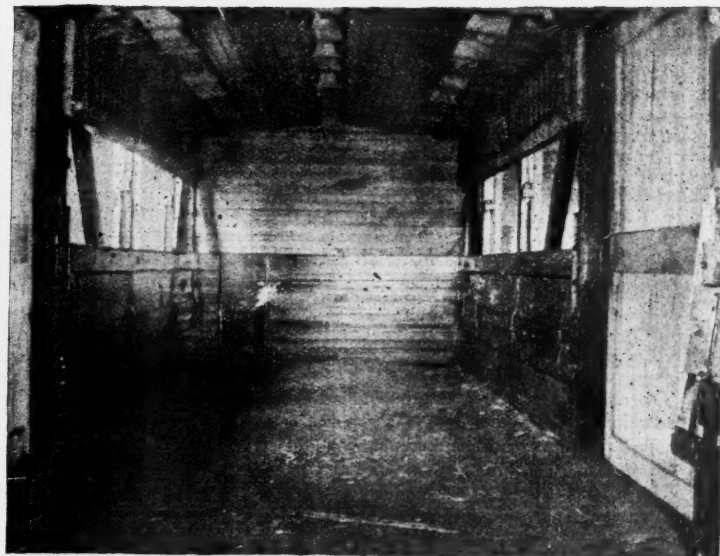
Exterior; as Stock Car.



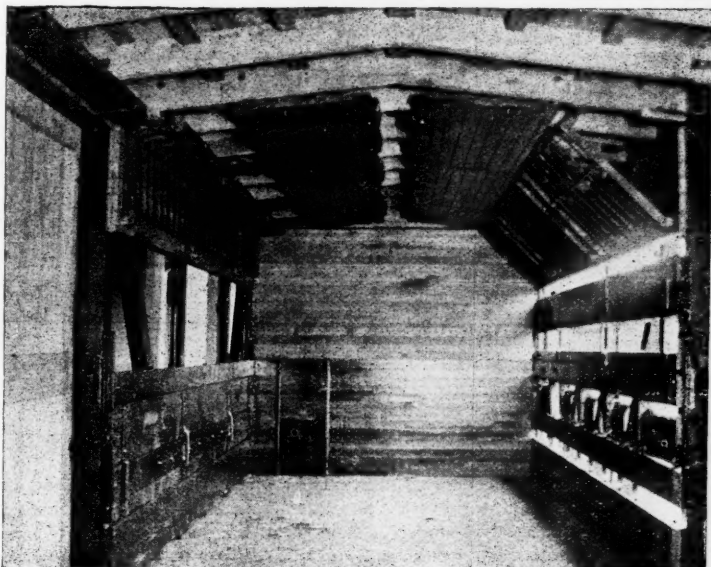
Exterior; as Box Car.



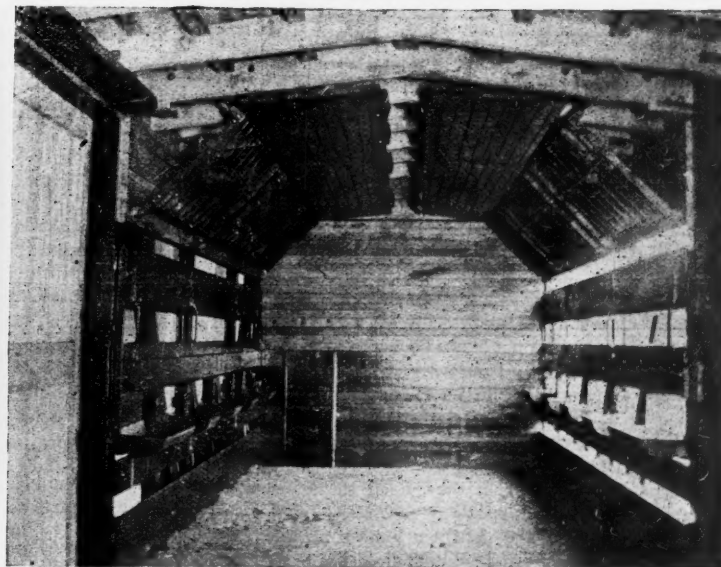
Interior; as Box Car.



Interior; as Coal Car.



Arranged for the transportation of horses or for protection of cattle from driving storm.



Interior; as Stock Car.

The Campbell and House Combination Freight and Stock Car.

The Commissioners show two of the most powerful engines that they have had built. One is an express and mail train engine designed in 1890. This has 6 drivers coupled and a 4-wheel bogie truck. The drivers are 5 ft. in diameter, cylinders 20x26 in., total heating surface 1,916 sq. ft.; grate area 27 sq. ft., boiler pressure 160 lbs. The total weight of the engine in working order is 56½ gross tons. The other engine shown is the American consolidation (Baldwin) also designed in 1890, which has been illustrated in these columns. This engine has 8 drivers coupled, a 2-wheel truck forward, drivers 4 ft. 3 in. diameter, cylinders 21x26 in., total heating surface 1,967 sq. ft., grate area 32 sq. ft., boiler pressure 160 lbs., weight in working order 62½ gross tons. A new type of consolidation engine has been designed which it is believed embodies the best features of the American and English locomotives. We show in our issue of Feb. 1 an

mile have grown from 2s. 5d. to 3s. 5d. Part of this gain is of course due to the greater carrying capacity of the freight cars.

Freight Cars.—When the Commissioners took hold they found a great number of cars which were unable to carry more than from 4½ to 6 tons, the axles being weak. They have gradually introduced cars of a greater capacity, some of these introduced in 1890 being tubular frame cars with bogie trucks 34 ft. 8 in. long over all, carrying capacity 22 tons, weight of car 10 tons. Another type introduced in 1892 has channel iron under frames, is 32 ft. long over all, has a carrying capacity of 23 tons and weight of 11 tons 7 hundred weight. The Commissioners do not believe, however, in the exclusive use of these long bogie cars, but have a type of 4-wheel cars like those in common use in England, with channel iron under frames, 16 ft. long over all, with a carrying capa-

into the Colonial Parliament a bill for the establishment of a provident and pension fund. In consequence of the influence of persons who posed as friends of the men, "labor leaders," we suppose, great feeling was created against this proposal and the Commissioners had the bill withdrawn.

Electric Railroads.

The Ballston Electric Railroad of Troy, N. Y., capital \$200,000, was incorporated in Albany last week. The company will operate a ten-mile electric street railroad for passengers, express and freight business from Ballston Spa to the town of Greenfield, Saratoga county. The directors are: Thomas Craig and Robert J. Brace, of Trenton, N. J.; Charles E. W. Smith, Roland F. Hill, of New York City; John H. Burke, Frederick R. Barnes, Thomas Keeley, of Ballston Spa; John Leggett and Joseph H. Leggett, of Troy.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

"How to Repel Train Robbers," is the title of a short paper in the *North American Review* for February by Lieut. John T. Knight, of the United States Army. His principal suggestion is that the express car should be placed at the rear end of the train so as to compel the attacking party to divide its forces. The express messenger should be able to communicate instantly to the cars, by electric alarm bell, or other effective means, and the passengers should be able to get repeating slot guns from a glass-front case in each car. Thus a messenger could give warning as soon as any one approached his door at an unusual time or locality, and the passengers and trainmen, being between the robbers attacking the engine and those attacking the express car, would have a decided advantage. Moreover, it would be necessary, in order to cover the engine, the express car and a sufficient number of points between, to employ so large a force of men that the probable profits per man would not be large; and this would discourage the industry. Mr. Knight has been in the cavalry service in Oklahoma Territory; in sending a guard to protect a paymaster he always ordered it to keep 100 to 150 yards behind the wagon carrying the money, so as to compel the attacking party to divide its forces. The lieutenant's suggestion seems sensible. If we are going to fight train-robbers the advice of expert fighters is worth attention. But, as we have heretofore said when discussing this subject, the only rational remedy is to civilize our country. Repulsing or punishing the robbers is not a satisfactory remedy, certainly not satisfactory to passengers, most of whom, in any train, even in the Wild West, come under the appellation "tenderfoot." To deter would-be robbers from getting together is the desideratum. That is the main element in the success of the police in large cities in repressing violence; they keep suspicious characters on the move as much as possible, so as to have them out in sight and let them know that they are being watched. Indeed, Lieut. Knight evidently regards the idea of making robberies unprofitable (by forcing the robbers to see that they will have to have a large force of men in order to accomplish their object) as his most valuable suggestion. This will deter them, if anything will, for their sole object is money.

Grade Crossings in Connecticut and Elsewhere.

The grade crossing question, which has caused so much excitement in Connecticut, has quieted down, the Bridgeport street railroad having failed to get its track across the New Haven road's line before the passing of the new law absolutely prohibiting such crossings. One of the humors of the controversy was the interest the New Haven company was said to have on the other side of the question. At Bridgeport it used every legal device to stop the construction of the crossing, but at Wilson's Point it had a gang of men

flying around in the liveliest manner, up to within fifteen minutes of the time the bill became a law, finishing the construction of a branch freight track to the Standard Oil Company's yard, across an existing street railroad. It appears that it succeeded just before the prohibitory law was signed by the Governor, and then for a number of days had to have twenty-five watchmen at the crossing, night and day, for fear the street car people would tear up the frogs. In fact, they were torn up once, but the New Haven people got them down again. At last accounts a truce had been arranged. The New Haven people say that they have no interest in this new branch railroad, their trackmen being merely lent to the oil company.

But though the general crossing law of the State is now such as to quiet the electric road problem, the citizens of Bridgeport seem to be only just at the beginning of their troubles, there being much difference of opinion about the arrangement for elevating the tracks of the New Haven road the entire length of the thickly settled portion of the city. This job, to cost several millions, involving many street crossings and a drawbridge, has been under discussion several years, and must be tackled before long. After long delay the railroad company prepared a bill to constitute a special commission to take charge of the whole work, as was done at the Harlem River and Park avenue, New York City; and, as we understood, got the acquiescence of the Mayor, or some one, on behalf of the city. But this bill is having a hard time in the legislative halls at Hartford, and the Common Council of Bridgeport is opposing it. The city attorney has prepared a bill in opposition to that favored by the railroad. This case forcibly illustrates the very troublesome nature of the problems connected with nearly every grade-crossing abolition. Conflicts of interest come up at every turn and in each case they affect values of such magnitude that every one concerned maintains his position with the utmost tenacity. No one will acquiesce in an adverse judicial decision, unless it be from the highest court, and so every question has to await slow legal processes. Difficulties enough come up, even in the abolition of a single country crossing, but in this case there are a dozen crossings, more or less, where the railroad and city cannot agree, because, according to the railroad's claim, the streets were not legally laid out.

The troubles of the long-established steam railroads are not ended by choking off the grade crossings. The Superior Court at Hartford is now considering the remonstrances of the New York, New Haven & Hartford, and the New York & New England against the laying of street tracks from New Britain to Hartford, and from New Britain to Berlin. On the first named route both these old roads have lines, and from Berlin to New Britain the New Haven company's line is a branch built expressly for New Britain business and nothing else. In the one case there is already ample competition, and in the other the single line, though somewhat in the nature of a monopoly, furnishes necessary and important service for New Britain and charges reasonable rates. It ought to be fairly supported. But if a street line serves a considerable number of way passengers at their doors, it, also, is a public benefit, and so the old companies must put up with Boss Tweed's answer to Father Knickerbocker.

Connecticut has done more toward abolishing grade crossings than is generally known, the amount expended by the State during the past two and a half years being nearly \$100,000. Probably the largest expenditure in this way has been by the New York, New Haven & Hartford Railroad Company, on its line between Greenwich and New London, where the number of main tracks has been doubled and where the railroad company has in many cases borne the entire expense of the improvements; but in some cases the towns bore a share. But some bridges have been made at other places in the State, on other roads, and altogether several hundred thousand dollars have been spent in separating grades. In 1893 the legislature provided that the State should reimburse the towns and cities for all expenses "incurred since May 1, 1885, for the removal of grade crossings under proceedings instituted by the railroad company," and the State Treasurer has paid out under this law up to the present time \$98,817. This is not so much as Massachusetts has thus expended; but Connecticut has only about half as many miles of railroad as its neighbor. The expenditures in Massachusetts

by the State since the passage of the law in 1890, and up to the close of the last fiscal year, aggregated \$478,359. This sum represents the actual payments. This is less than half the State's share of the cost of all the work undertaken—that which has been finished and that now under way; and assuming that the State pays one-fourth of the total cost in each case, the entire amount thus far provided for, that is, the cost of all the plans thus far approved by the Superior Court, is \$3,897,316. This does not include the extensive improvements on the Providence division of the Old Colony, near Boston, for which a separate law was passed, imposing a larger share upon the State. (Some notes on the Massachusetts law were given in these columns last week.)

The question of abolishing grade crossings is also receiving attention in the New Jersey Legislature, where a hearing has been held to discuss the difficulties of this kind in Newark. That city has two of the worst crossings ever heard of. At Market street, near the Pennsylvania Railroad station, it is estimated that 1,500 electric cars cross daily. No attempt is made to enforce the city ordinance regulating the speed of trains, because if the speed were reduced the crossing would be covered with cars all the time. At the Broad street crossing of the Delaware, Lackawanna & Western over 1,000 electric cars pass daily and the number of pedestrians is estimated at 25,000. Things are still moving at Buffalo, N. Y. Mr. Adam, Chairman of the Commission which has been trying for four years to settle the very complicated problem of the grade crossings in that city, tells a reporter that the worst obstacles seem to be nearly overcome. The action of the New York Central in beginning work on some of its crossings, and the strengthening of the State laws giving power to the Commissioners, have aroused the other companies, and the Lake Shore & Michigan Southern is now ready to go to work. A contract between that road and the Commission is under discussion, and it is expected that it will be completed within a few days. The Erie and the Buffalo Creek railroads are also said to have come into a more favorable attitude.

Fuel Saving on Railroads.

French experiments with locomotive boilers, given in the *Railroad Gazette*, January 11, p. 17, are directly in line with the discussion at the Western Railway Club at its last meeting, an abstract of which was given last week. Mr. Forsyth's paper discusses the wide variation in the heating power of different fuels, and Mr. Bush's paper discusses a method of saving fuel by giving premiums to the firemen and engineers. The discussion of these papers showed an appreciation of the fact that a railroad is in business to haul paying freight and not to save fuel. This is important, as the mechanical men have been accused of forgetting the real object of a railroad, in their enthusiasm for fuel economy; but the mechanical men claim that whatever the purpose of running a road, there is no excuse for a waste of coal.

The effect of large grates on the efficiency was talked over and the discussion showed that but little that is definite is known about the matter. This is one of the reasons why the proposed tests at Purdue are being pushed ahead. Mr. Forsyth asked if it pays to keep an account of the fuel used on a railroad? He got an answer, perhaps not directly, but so plainly that no railroad manager can fail to understand it. The answer is found in the important fact that as large a sum as \$2,000,000 is annually expended on some roads, and a proportionate sum on other roads, and frequently no adequate account is kept of the details of the expenditure. Often there is no check on the waste and the mechanical men tell how the men on the engines take coal from cars to help out their records, and in other ways how fuel is wasted which a proper system of accounts would save. In many cases there is no check on the mine weights and the coal given out to engines is not weighed. The whole tenor of the discussion was that a saving of a large amount was possible if the records were so kept that the losses could be located. It is said that on some roads it has been found that under exactly the same conditions one fireman will use 40 per cent. more coal than another, and that most crews can save 15 per cent. when they try.

These are the facts that have led to trials of systems of coal premiums, which, in some cases, have been productive of savings, but in other cases have led to a dissatisfaction among the men, mainly because the plan followed has led to injustice. The trials of coal premium systems have shown forcibly

that a large saving is possible, and that no system can be fair to all unless it has the most intelligent attention and is worked up gradually to meet the conditions. It is of little use to go at the matter in a half-hearted way and set the premiums arbitrarily, and this is equally true of any system of posting monthly statements in the roundhouses. Men get discouraged when their records are compared with others who work under more favorable conditions, unless allowance is made for the differences of conditions.

A train mile basis is fallacious, for the work required to haul some classes of trains a mile is twice as much as that required to haul other classes. A car basis is almost as fallacious, for it takes much more coal per ton of load to haul an empty car than to haul a loaded one. Often a loaded car on a level track does not give much more resistance than an empty one. On heavy grades it is different, as then each ton of load offers nearly the same resistance, whether in empty or loaded cars. The ton-mile is the most accurate of the different bases commonly used, but 1,000 tons of empty cars are much harder to haul than the same total load in loaded cars, especially if there is a side-wind blowing. It is possible, by working at the subject on any given road, to get a reasonably accurate ratio between loaded and empty cars in the matter of resistance, and a plan can be found for equating different trains so that the coal that is needed to haul trains of different make-up, at different speeds and under different conditions of weather, can be laid down so closely that no injustice will be done to the men. The amount of labor involved is small, and the total cost is but a small percentage of the saving that can be obtained. It cannot be expected that the employees of a railroad will try to save coal when the officers do not care enough about the details of the expenditure of money for fuel to keep a record of how carefully the coal is used.

It is, of course, a question whether a coal premium is best until the system of accounts and fuel allotments to trains is so perfected that justice can be done to all. There will be a good saving in most cases when a detailed record is kept, for then the places of waste will be pointed out, and when a waste is made apparent, it will generally be stopped.

It is not enough to find that a certain train crew wastes fuel; one must go further and show how the waste occurs, and for this part of the work there must be a good traveling engineer and perhaps a traveling fireman whose duties are to ride with the delinquent train crew and report the cause of the waste and to say whether it lies with the engine or the crew. In this way such definite information is obtained that a train crew can be suspended without causing complaint. The traveling engineer and fireman should be able to set the pace for the regular crew, and the regulars may be justly required to come up to a certain per cent. of the performance of the experts. Six months' work would set the pace on all of the regular trains and give good ground for an accurate estimate of the necessary fuel for the irregular trains. Some additional work in the coldest weather would give a reasonably accurate allowance for difference of temperature. This sort of work cannot be done spasmodically or carelessly, and before it can be done at all, those who watch expenditures must be convinced that it pays to record the work done and the coal used to do it.

Mr. Forsyth's paper treats more particularly of the value of good fuel and of the advantage of making tests to determine the fundamental quality. This point he proves with perfect clearness. It does not take much proof to show that fuel can be no better than its calorimetric and chemical analyses indicate. If it has bad mechanical qualities that is a matter for further consideration; first it must be known whether the fuel has the possibility of goodness, and the chemical and calorimetric tests determine this beyond question. The argument used in discussion of this paper by one of the members, that it is not safe to rely solely on a chemical test, is an old one, and is accepted by all who have had experience with different kinds of fuel. It has been many times said that the only way to get at the real value of a new fuel is to try it under the conditions where it is proposed to use it. This brings out the mechanical properties, and will not bring out the heating qualities except in a general way unless an accurate test is made. If the chemical test, shows the fuel to be bad it may be taken as a fact that the fuel will not be good in an actual test. But if the chemical test shows the fuel to have good qualities and a high heating

power it does not follow that it can be used to advantage, as there may be mechanical qualities that will ruin it. If the fuel is shown to be bad by a chemical test no mechanical quality can make it good. So the chemical test has its place, and this has been shown before in these columns when the matter of having a standard testing boiler was being discussed.

A railroad company has every opportunity to learn the value of a new fuel, as Mr. Forsyth has shown. First make the calorimetric test, which is very simple. This gives the heating power, the moisture and the ash. Then do the sensible thing and try it practically. All that is not known about the working properties of a fuel after this examination is not likely to be worth knowing from a railroad standpoint. But as to the real commercial value more must be known, and the best way to get at it is to make a number of runs under as nearly equal conditions as possible, either on the road or on a test locomotive. With equally acceptable mechanical properties, such as clean fires, spark throwing, smoking and friableness, that fuel has the highest commercial value which turns the most water into steam.

The considerable argument that was offered at the Western Railway Club against reliance upon chemical and calorimetric examination, was not intended, as we take it, to show that such examination was not of value, but to show that a practical trial is needed to settle the commercial value. This all will accept.

The other phase of fuel saving plans, that of encouraging the engineers and firemen to waste as little as possible, was well considered, and those who read the discussion will be impressed with the lack of confidence that many have in all plans of premiums. Some believe that the present knowledge of what makes a fair allowance of fuel for a given train is too meagre to permit an even treatment of the men and that all arbitrary allowances lead to dissatisfaction and discontent. All the more important roads seem to be moving toward some plan of rating men according to the fuel they use, but the movement is a slow one, and first must come a plan for determining the loads of trains in tons and a better knowledge of the difference in the resistance of trains of the same total weight in which the number of cars varies greatly. All we know about the matter at present is that it is easier to haul 1,000 tons in fully loaded 60,000 lb. cars than it is to haul the same load in empty cars, but the difference is not known; it is probably as much in some cases as 50 per cent. Without this information there is not the possibility of treating the men fairly. The train mile basis is too ridiculous to consider seriously. The ton mile is somewhat more sensible, but that is not quite fair to the men. The nature of the train must be known, that is, the number of cars, and an allowance must be made for this in each case; also the weather must be considered, for with a strong side wind a crew might run behind in fuel in one trip more than they could make up in ten ordinary trips. The mere accident of a side wind for several days would put a good crew behind for the month. Then also the engine must be listed according to its merits and its condition, and for this purpose the traveling engineer or fireman is indispensable. A master mechanic cannot, as a rule, tell what an engine crew should do with a given engine unless the engine has been practically examined by him in operation on the road. The traveling engineer should be relied on to set the pace for the regular men, and the regulars should not be required to do better than the expert can with the same engine and train.

Now, all this looks like a big and almost endless job, but it is not. One year's careful work will perfect a basis that will do to start with, and after that the needed corrections can be made as they come up. At the end of two months the regular trains can be listed with certainty for all ordinary weather and all unusual trips can be thrown out from the record until they are better understood. The number of extra men required on one ordinary section of a road is not over four, two clerks and two traveling men. Just as soon as one train and run is well examined the men on that run can be put on their merit and saving will begin at once, if we are to judge by what has happened in most cases, and by what has been said at the Western Railway Club where the practical men have discussed the matter.

Each road must determine for itself whether it will pay to save fuel or not, for the question is not whether it will pay to keep an account of the fuel used, as Mr. Forsyth has put it. We are far beyond that point. All railroad men of experience know

that to watch the use of supplies on a railroad brings economy. The point to be settled in the minds of some is whether a saving of from 15 to 30 per cent. in the fuel bill will make a perceptible increase in the dividends. Some roads have said that fuel is so cheap with them that a saving of say 15 per cent. in the fuel would not be worth the trouble to get, as the stockholders would not appreciate it. If that is the policy that has been carried out in other departments of some of those roads then it is not remarkable that they are now in the hands of receivers. One large road that has for a long time held that a fuel saving would not benefit the stockholders formerly paid a dividend of 10 per cent. Now it pays 4 per cent. and maybe soon it will pay less, as the recent dividends have been taken from some other place than the earnings. With a continued decrease of profit the time will come when the possible fuel saving will be attractive as a means of pleasing the stockholders, and then there will be no need of asking the question whether it pays to keep an account of the detail distribution of several millions of dollars' worth of fuel supplies. The question will then be, How can we use fuel to the best advantage?

One of the speakers at the Western Railway Club said that he always wondered why it was that his road had always bothered his department with calls for savings in small supplies, over which he has very little control, such as supplies for repairs due to wear, when nothing of real importance was ever said to him about saving fuel, that being one of the items in which he could save a large sum if given a chance to do so.

If it should happen that some of the mechanical men should speak their full minds there will be a scramble in some quarters to get at a system of records that will tell where the waste is, and then the plan of permitting the men at the coaling stations to increase their accounts, of the fuel delivered to engines, so as to make them agree with the mine weights, will be stopped, and some other way of making easy bookkeeping in the fuel accounts will be discontinued to the advantage of the stockholders.

Train Accidents in 1894.

We present herewith a table giving a summary of train accidents in the United States, as published monthly in these columns, for the calendar year lately closed, together with three smaller tables, which show certain features of the report more in detail. Table No. 1 is self-explanatory.

As might be expected from the long continued depression in business, and the consequent diminution in the number of trains, the number of accidents reported is scarcely more than two-thirds that reported in 1893, and is smaller than that for any other year since 1887. The change began in the latter part of 1893, and the depression in business was probably worst in the first three months of 1894, although it is to be remembered that the number of trains run is always less in the winter. In our monthly record for March, printed in the issue of April 27, we presented a comparison, showing that in the first three months of 1894 the total number of accidents was 51 per cent. less than for the same period in 1893, and the number of persons killed 45 per cent. less. At the same time the earnings per mile of road, so far as they could be estimated from the reports of a portion of the roads, published in the *Financial Chronicle*, fell off only about 15 per cent. Though this estimate can lay no claim to accuracy, it is undoubtedly true, as the figures indicate, that the diminution in the number of trains, especially on single track lines and roads lacking facilities, and the discharging of many hundreds of employees, resulting in an elevation of the average ability of the men employed in handling trains, tended to increase the safety of railroad travel, both to the lives and limbs of passengers and employees, and per unit of merchandise.

The record of 1894 is marked by only two accidents killing a large number of passengers. The first was the rear collision at Hackensack, N. J., in January, and the other was that at Lincoln, Neb., in August. The former led to the immediate erection of a good number of block signals on the road where it occurred. The Lincoln disaster is believed to have been caused by the malicious misplacement of a rail near a bridge. In the month of May there was a collision at Princeton, Ky., in which eight employees were killed.

The record for 1894 is encouraging in the total number of casualties, as well as in the smallness of the list of notable disasters. The year 1893 was remarkable for the most startling series of railroad accidents ever known (with the possible exception of 1887), and a comparison with that year might be misleading; but with 1892 and previous years the comparisons show that the number of persons killed and injured fell off faster than the number of accidents; while if we eliminate from the record the "other persons," who were mostly tramps, stealing rides on freight trains, we find that the total number killed in 1894 was only 56 per cent. of the total in either 1893 or 1892.

Following is the classification of the casualties of 1894 according to the class of accidents in which they oc-

curred, the records for the previous seven years being shown for comparison.

	Killed.	Em- ployees.	Pass- engers.	Other persons.	Total.	*Train Mileage. Millions.	No. Persons Killed per Million Train Miles.
In collisions.....	119	148	26	42	187	.....	.....
In derailments.....	13	2	5	20	.....	.....	.....
In other train accidents.....	.....	.....	.....	.....	.....	.....	.....
Total.....	280	58	104	442	.....	.....	.....
Total 1893.....	424	178	89	691	889.4	0.777	.....
Total 1892.....	490	116	66	672	864.9	0.777	.....
Total 1891.....	550	177	63	790	831.2	0.950	.....
Total 1890.....	569	172	65	806	793.9	1.015	.....
Total 1889.....	336	108	48	492	622.0	0.681	.....
Total 1888.....	434	168	65	667	688.8	0.968	.....
Total 1887.....	406	207	43	656	644.0	1.018	.....
Injured.	408	186	22	615	.....	.....	.....
In collisions.....	397	210	61	670	.....	.....	.....
In other train accidents.....	9	14	5	58	.....	.....	.....
Total.....	845	410	88	1,343	.....	.....	.....
Total 1893.....	1,243	1,240	101	2,484	.....	.....	.....
Total 1892.....	1,205	1,128	74	2,407	.....	.....	.....
Total 1891.....	1,447	1,183	55	2,685	.....	.....	.....
Total 1890.....	1,519	1,224	69	2,812	.....	.....	.....
Total 1889.....	978	745	49	1,772	.....	.....	.....
Total 1888.....	1,098	1,012	94	2,204	.....	.....	.....
Total 1887.....	890	916	140	1,946	.....	.....	.....

* Train mileage is taken from Poor's Manual, which gives revenue mileage only.

The more prominent causes of collision for six years past are shown in the following table:

	1894.	1893.	1892.	1891.	1890.	1889.
Train breaking in two.....	88	118	101	96	65	82
Misplaced switch.....	50	80	90	78	90	59
Failure to give or observe signals.....	54	198	140	153	82	58
Mistake in giving or under- standing orders.....	31	67	78	88	73	46
Miscellaneous.....	166	240	201	259	243	150
Total explained.....	389	613	610	674	553	385
Unexplained.....	224	383	452	463	488	354
Total.....	613	996	1,062	1,137	1,041	739

In reading the tables contained in this article the reader must bear in mind that most of the facts for the record are taken from the daily newspapers, and that the cause is given as gathered from such accounts; though all accidents of peculiar importance are inquired into. Those in which no person is killed or injured are not published with date, locality, etc., as was our custom up to October, 1890, but they are included in the tabular statistics.

As a point of incidental interest we have noted in our monthly records the more serious accidents on street railroads during the past three years. In 1894, the number of casualties under this head was less than in either of the previous two years. We have noted 61 accidents in which eight persons were killed, and something over 100 injured.

The fate of the pooling bill is still unsettled as we go to press, though its friends hope to get it considered today, (Feb. 8). No serious obstacle to its passage has developed since the Senate Committee decided to report it, but the increasing pressure of the currency question and other measures deemed more important than the pooling bill, causes some anxiety. The legislatures of Minnesota and Idaho have passed resolutions against the bill, and Senator Chandler, of New Hampshire, has introduced in Congress a resolution asking for a lot of figures from the Interstate Commerce Commission and setting forth in thrilling language the terrible dangers to be apprehended from the legalization of pooling. "The railroads of the country may," he says, "unite or form one company with a capitalization of \$10,506,235,410, the gross earnings of which were for a year \$1,220,751,874, and the net income after paying fixed charges \$111,053,034. They may agree to commit the management and disposition of this gross or net income to a managing board of three officers of the various roads. This board can be given authority and discretion to pay out for the purpose of controlling legislatures.....After the partnership is formed the companies composing it may raise rates of fares and freights to any height they please, uncontrolled by national law."

But this buncombe seems to have been taken at only its actual value, while, on the other hand, the committee appointed by the National Board of Trade visited Washington last week and presented to the Senators a copy of the resolution the organization passed favoring the pooling bill. It is as follows:

"Resolved, That, in the judgment of the National Board of Trade, which represents the shippers, and not the railroads, of this country, the Patterson Pooling bill will not abrogate legitimate competition among railroads, but will tend to prevent unjust discriminations and promote the interests of all shippers, who are satisfied with reasonable, uniform, and stable rates; that the far-reaching influence of water transportation has assured to this country much lower rates for railroad transportation than are enjoyed by any other people in the world, and the evil to be guarded against at the present time is not high rates, but unjust discrimination in rates. Our members protested against amendments offered to this bill in the interest of the railroads when it was pending in the House, on the ground that it was bad faith to seek such amendments to a measure agreed upon at a convention representing both mercantile and railroad interests, and these amendments were withdrawn. For the same reason, we deprecate further amendments in the Senate, and respectfully but earnestly urge its adoption by that body."

On the Minneapolis, St. Paul & Sault Ste. Marie each locomotive engineer hires his own fireman and pays him whatever he sees fit, the company paying the engineer enough for both, but requiring an acknowledgment

from the fireman that he has been paid in full for his month's work, naming the amount. According to *Locomotive Engineering*, from which we take this information, the company has established an elaborate set of regulations with the intention of making this arrangement permanent, if possible. The company discharged all its firemen on Aug. 27 last and the engineers at once re-engaged them after agreeing to pay them the same rates that they had been receiving from the road. The principal restrictions by the company on hiring new men are that they shall have good eyesight, good health, good character and be not over 35 years old. The company

to retire junior engineers when the average mileage equals 2,400 miles a month. As our contemporary sagely remarks, the success of this plan will depend upon how it works, and so we shall have to wait and see. According to the last Poor's Manual, the road named had 93 locomotives.

The Chesapeake & Ohio is now using the Webb & Thomson train staff, apparatus having recently been put up at each end of a two-mile section of single track where there is a tunnel and other obstacles to the construction of a second track. The machines have no pro-

TABLE NO. 1.—TRAIN ACCIDENTS—THEIR NATURE AND CAUSES, FOR TWENTY-TWO YEARS.

	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1878-82. †	1873-7 ‡
TRAIN MILEAGE IN U. S. in millions of train-miles.....	800	889.4	864.9	831.2	793.9	722.0	688.8	644.0	.....	.....	.....	.....	.....	.....
COLLISIONS:														
Rear.....	280	455	485	555	495	379	404	362	338	316	288	413	275	155
Butting.....	134	223	251	284	323	260	311	309	127	120	138	177	121	96
Crossing and miscellaneous.....	199	318	326	298	223	110	89	29	36	28	27	39	21	43
Total collisions.....	613	996	1,062	1,137	1,041	749	804	700	501	464	445	630	417	295
DERAILMENTS:														
Broken or spread rail.....	32	71	63	53	38	32	61	50	45	102	60	84	48	71
Loose or defective switch.....	35	57	53	68	44	28	43	31	81	65	68	88	34	31
Broken bridge or trestle.....	23	30	20	42	38	42	40	39	20	32	34	35	27	24
Broken or defective switch.....	16	41	26	38	33	10	29	23	7	13	9	12	3	9
Broken or defective frog.....	5	16	12	11	12	7	16	7	20	11	11	7	2	5
Other defects of road.....	3	9	8	2	2	1	1	2	1	.....	.....	1	2	9
Total defects of road.....	114	214	191	214	167	120	180	152	174	223	182	227	116	149
DEFECTS OF EQUIPMENT:														
Broken wheel.....	33	48	46	39	37	28	48	27	37	41	22	40	28	22
Broken axle.....	71	88	56	66	59	48	44	45	62	48	10	60	36	32
Broken truck.....	18	31	28	38	25	20	27	8	14	18	12	24	11	10
Failure of coupling or drawbar.....	27	29	27	20	7	5	7	4	3	6	3	2	1	4
Fall of brakebeam.....	10	19	23	27	12	9	9	10	6	10	.....	.....	.....	.....
Other defects of equipment.....	23	26	26	25	18	10	13	6	.....	.....	.....	.....	.....	.....
Total defects of equipment.....	182	241	206	215	158	120	148	100	122	123	67	129	79	76
NEGLECTANCE:														
Misplaced switch.....	5	67	98	78	54	54	70	49	68	55	82	89	77	76
Neglectance of trackmen or bridgemen.....	6	14	5	16	8	10	3	4	4	4	2	9	5	9
Runaway engine or train.....	1	4	1	9	19	8	14	6	2	.....	.....	.....	.....	.....
Open draw.....	4	4	2	3	5	1	4	2	5	5	4	4	2	2
Other neglectance.....	39	48	57	38	22	19	26	12	.....	.....	.....	.....	.....	.....
Total neglectance in operating.....	103	137	164	144	108	92	117	74	76	64	94	112	91	97
OBSTRUCTIONS:														
Animals on track.....	38	50	51	61	56	41	57	32	36	25	28	45	39	48
Snow or ice.....	12	16	7	6	6	5	22	6	27	30	7	13	13	20
Washout.....	5	16	17	19	18	20	19	11	22	22	25	21	21	28
Accidental obstruction.....	31	27	30	28	28	24	34	16	21	7	18	16	7	6
Malicious obstruction.....	19	32	29	20	28	8	20	31	17	17	42	53	32	38
Switch or rail purposely misplaced.....	48	35	27	42	26	20	14	12	15	15	12	12	13	15
Other unforeseen obstructions.....	11	5	8	5	13	8	5	9	4	6	3	19	.....	.....
Total unforeseen obstructions.....	178	197	179	192	194	131	193	129	167	135	152	199	128	158
OTHERS:														
Unexplained.....	296	425	425	439	377	296	385	243	102	136	186	259	231	223
Total derailments.....	873	1,212	1,165	1,204	1,004	759	1,032	705	641	681	681	926	646	709
ACCIDENTS WITHOUT COLLISION OR DERAILMENT:														
Boiler explosions.....	9	24	19	19	21	13	15	14	19	11	16	13	14	10
Cylinder explosions.....	2	4	5	12	6	3	7	2	2	.....	.....	.....	.....	.....
Broken parallel or connecting rod.....	12	8	10	8	9	5	22	17	22	28	17	26	14	10
Cars burned while running.....	16	18	13	19	15	4	7	8	9	13	13	8	9	9
Various breakages of rolling stock.....	8	14	15	16	21	18	15	33	6	17	13	23	8	13
Other causes.....	27	31	38	29	2	18	33	12	12	7	4	4	1	6
Total without collision or derailment.....	74	99	100	103	101	61	99	86	69	72	65	84	46	51

RECAPITULATION.

Collisions.....	613	996	1,062	1,137	1,041	749	804	700	501	464	445	630	417	295
Derailments.....	873	1,212	1,165	1,204	1,004	759	1,032	708	641	681	681	926	646	709
Other accidents.....	74	99	100	103	101	61	99	86	69	72	65	84	46	51
Total.....	1,560	2,207	2,327	2,444	2,146	1,569	1,935	1,491	1,211	1,217	1,191	1,640	1,109	1,065

* Train mileage is taken from Poor's Manual, which gives revenue mileage only; that for 1894 is estimated.

† Averages per year, for five years, 1878 to 1882, inclusive.

‡ A average per year, for five years, 1873 to 1877, inclusive.

TABLE NO. 2.—CASUALTIES TO PASSENGERS AND EMPLOYEES IN TRAIN ACCIDENTS IN 1894.

Tabulated According to Classes of Causes.

Month.	Defects of road.				Defects of Equipment.				Negligence in operating.				Unforeseen obstructions and maliciousness.				Unexplained.				Total.				
	Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		Pass.		Emp.		
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	
January..	0	5	6	9	2	6	3	6	21	55	5	23	0	0	1	8	1	7	24	74	16	49			
February	0	11	0	5	0	1	2	7	1	0	0	10	24	0	0	0	0	2	1	1	12	14	45		
March...	0	0	1	5	0	0	3	3	1	0	9	4	11	0	8	31	0	8	15	0	17	17	63		
April....	0	0	1	5	0	0	1	6	6	1	19	4	40	0	0	6	6	2	0	3	20	17	59		
May.....	1	7	1	4	0	0	3	2	0	9	17	49	1	15	8	0	6	1	7	2	37	70			
June.....	0	3	2	7	0	4	4	3	0	2	8	41	0	5	4	6	0	4	17	0	14	22	74		
July.....	0	0	2	6	1	6	2	11	0	20	28	48	5	12	10	26	1	4	1	4	7	42	43	95	
August...	0	0	3	6	2	0	0	7	0	9	10	48	8	10	11	15	0	4	1	18	10	21	25	94	
Sept.....	1	3	2	6	0	0	3	6	2	15	12	44	2	10	6	14	4	7	14	5	32	30	84		
October..	1	0	1	8	0	0	2	3	0	34	11	69	0	42	3	16	3	19	8	11	4	95	25	107	
Nov'mb'r	0	0	0	3	0	1	0	3	0	10	13	29	0	1	3	9	0	2	1	3	0	14	17	47	
Dec'mb'r	0	4	4	6	0	0	0	1	2	20	14	36	0	0	2	2	0	6	4	13	2	30	24	58	
Year.....	3	33	23	70	5	19	24	56	27	202	136	462	16	95	61	145	7	61	36	112	58	410	280	845	
Year,1893	15	336	32	121	3	64	47	75	152	634	243	742	1	56	156	167	7	150	46	138	178	1,240	424	2,123	
Year,1892	23	322	39	103	2	85	61	93	78	514	271	718	5	88	72	177	8	117	47	113	116	1,126	490	1,204	
Year,1891	24	291	45	101	7	90	42	65	114	458	345	939	23	116	57	154	9	228	61	188	177	1,183	550	1,447	
Year,1890	19	195	61	126	4	86	30	77	115	624	337	959	24	103	60	165	10	216	81	192	172	1,224	569	1,549	
Year,1889	16	167	30	81	7	58	24	63	46	291	189	595	34	107	53	120	5	122	40	119	108	745	336	978	
Year,1888	5	195	45	153	16	65	57	92	92	388	217	573	11	106	77	163	44	258	60	117	168	1,012	434	1,098	

without stopping the train or even materially reducing its speed.

A notion of the enormous sums of money that Russia is pouring into the Siberian railroad may be got from the recently published figures of the financial budget for 1895. In that document the estimate for the Siberian railroad proper for 1895 is \$24,261,000 and for works auxiliary to that railroad \$1,273,000—say a total of 25½ million dollars. The estimate for 1894 for these items was \$17,964,000—about 43½ millions in two years. Beyond this it is proposed to raise \$15,733,000 for the construction of other railroads, besides \$5,272,000 for cheap local railroads. How long Russia will be able to keep up such expenditures probably no man can more than conjecture.

Timber-Preserving Methods and Appliances.

(Continued from Page 82.)

Testing Ties.—At intervals during the regular progress of the work and whenever any change shows some change in the treatment as to necessary vacuum, time or amount of pressure, and after each change in kind, quality or dryness of timber, four sample ties are taken from a charge consisting of ties of average grain, one heaviest, one lightest and two average weight, and each tie is bored in the middle of its width and length with a one-inch bit. The first half inch of borings is thrown away, after which each inch of borings is preserved separately and designated as one-inch, two-inch and three-inch specimens. Each specimen is turned to an ash over a gasoline jet in a porcelain roasting-dish in contact with the air. The ashes are carefully collected in a platinum cup, distilled water added, with a slight excess of hydro-chloric acid, converting the zinc oxide into zinc chloride. It is then filtered into a test tube, and the zinc hydrate thrown down with sodium carbonate, making a white flocculent precipitate. The liquid is then made up with distilled water to three drachms. The resulting milky fluid is compared with standard liquids in tubes of the same size as the test tubes, each tube containing three drachms. The standard liquids are graded to represent 6, 9, 12, 15, 18, 21 and 24 one-hundredths of a pound of zinc chloride per cubic foot of timber. As shown by the annexed table of proportionate parts (for which, as well as for much of the other data in this paper, I am indebted to our fellow member, Mr. J. D. Isaacs, who has designed most all of the details of the plant, and devised many improvements in the method of operation), the maximum of zinc chloride, per cubic foot of timber desired is $\frac{24}{100}$ of a pound. We are so certain of what we are doing by our methods of observation that the tests are principally of value as checks. Recent tests have sometimes shown a minimum of $\frac{1}{10}$, but usually indicate the full amount. It is to be recollected that this minimum is from the geometric center of the tie. In such cases specimens taken nearer the ends show prescribed quantity. After boring the ties are plugged with creosoted sticks turned to a tight fit, and shipped for use with the test.

Records.—A tabular record of each charge, giving all dates, times, durations, pressures, and temperatures is kept and charges numbered; a similar tabular record of all tests is kept and duplicates forwarded to headquarters. All ties are stamped on the ends with the month and year of treatment.

We have found it economical and convenient to manufacture our own chloride of zinc stock solution. The apparatus is simple and inexpensive, and requires little attention. It consists of three lines of barrels arranged in steps. Beginning with the top and numbering them 1, 2, 3, 4, 5 and 6, they are arranged as follows:

No. 1, bottom 3 inches above top of No. 2, and has a lead spout emptying from the bottom into the top of No. 2.

No. 2, bottom 12 inches above bottom of No. 3, and has a lead pipe from near bottom to top of No. 3.

No. 3, bottom 6 inches above bottom of No. 4, and has a lead spout from near bottom to top of No. 4.

Nos. 4 and 5 same as No. 3, each emptying in same way into that below. Each barrel is charged with about 600 pounds of zinc.

The carboys of muriatic acid are lifted to a platform beside barrel No. 1, through which the acid trickles rapidly, taking off, so to speak, its wire edge; that is, preventing violent action in barrel No. 2. In barrel No. 2 some ebullition takes place. The heavier, partially-formed, chloride sinks to the bottom, passes up through the lead pipe, and over into No. 3, and so on. We found it necessary to raise barrel No. 2 higher than the rest of the series in order to get head for flow through its discharge pipe, some of the head being lost by the upward action of the hydrogen gas and steam. A continuous stream of zinc chloride, completely saturated as to the acid, runs from the pipe of No. 5, but to make certain, we run through No. 6; thence into storage barrels standing ready for use. The capacity of the chemical plant is about 5,000 pounds of stock solution per ten hours. After each carboy of acid is emptied one-eighth of its weight in water is thrown into barrel No. 1, which has the effect of cooling the zinc, keeping down somewhat the ebullition in barrel No. 2, and supplying water evaporated. The loss of chlorine by evaporation is about one per cent. We find a better result by this process than by allowing the acid to simply stand on the zinc. The resulting zinc chloride stock solution has a density of 50 degrees Beaumé and contains 43 per cent. of zinc chloride.

Creosoting or Impregnation of Timber with Dead Oil of Coal Tar.—The portable plant is arranged for creosoting timber also. This requires only the additional adjuncts

of a superheater and steam coils in the retorts. Although we treat sawn timber with creosote, the bulk of the timber treated is in the form of round piles of Oregon fir. The material proved to be extremely difficult of treatment by any of the standard methods. The temperatures and pressures had to be forced and the time required was very long (32 to 38 hours) to get any effective penetration. The piles after treatment were badly split and checked and their strength seriously impaired.

In November, 1891, some experiments were undertaken with a view to overcoming these objectionable results. These experiments lead up to our present standard creosoting process, which closely corresponds with the methods advocated by Boulton 10 years or more ago. We merely boil the timber in the dead oil, and when sufficiently dry inject the oil by pressure. In effect, we have returned to the open-vat process tried 50 years ago, plus pressure in a closed retort. An open vat for boiling, followed by the introduction of the timber into a closed receptacle for injection, would answer the same purpose, but we find it more convenient to perform both parts of the process in the same retorts. In this process we use no vacuum, but pass the vapors, during boiling, through the surface condenser, leaving the outlet from the latter open to the air. The object in using a condenser is to enable us to measure the sap extracted from the timber and to recover the lighter portions of the creosote carried over with the vapors of sap. Every foot in the measuring well of the condenser corresponds to $\frac{1}{2}$ pound of water, or sap, per cubic foot of piles treated for average loads, and we find that the piles are practically dry when the condenser gage shows 6 inches per hour. The same precautions as in burnettizing are used to follow the characteristics of each load and to vary the treatment accordingly.

The result of these changes in treatment has been most satisfactory. The time has been cut down to 12 to 14 hours per charge, as against our former time of 32 to 38 hours, and as against that required in present Eastern practice of 22 to 27 hours. Temperatures are reduced from 280 degrees F. to 240 degrees; pressure reduced from 200 pounds to 120 pounds; fuel about one-half formerly used per charge. The timber is practically uninjured by the treatment. It is less checked than in ordinary air-seasoned timber, and whatever checking takes place is during the boiling, so that all checks are well filled with creosote.

In common with timber in burnettizing, the greener the wood is the more easily it is impregnated with creosote. No difficulty is experienced in securing any desired penetration.

Memorandum of Experience with Treated and Untreated Ties.—The treatment of ties with preservative substances was commenced in Europe as early as 1838, perhaps earlier. Of the many and various materials treated with on a large scale, only about four seem to have been used to any considerable extent. These were sulphide of copper, bi-chloride of mercury, chloride of zinc and creosote oil, and of these four only two seem to have survived for general use, namely, chloride of zinc and creosote. The former, on account of its comparative cheapness, is the one most commonly used.

The average results of tie-preservation in Germany, where, perhaps, more careful records have been kept and investigations made than elsewhere, indicate that the life of railroad ties (so far as decay is concerned) is almost exactly doubled by preserving them.

In November, 1889, a small number of burnettized ties were put in the track, in a gravelly-clay roadbed, near Tucson, Ariz., and an inspection just made, after four years and eleven months of service, shows that all of these burnettized ties are perfectly sound. At the same time and place various untreated ties were put in the track adjoining the burnettized ties; of these Truckee white fir has decayed to a depth of about $\frac{1}{4}$ of an inch on the under side; Truckee yellow pine has decayed to a depth of from 1 to 3 inches on the under side; Truckee red fir $\frac{1}{2}$ inch decayed on under side; Truckee tamarack and Truckee sugar-pine decayed from $\frac{1}{2}$ to 3 inches on under side; Shasta white fir and white yellow pine decayed on under side from 1 to 4 inches; Shasta red fir decayed on under side to a depth of from 1 to 2 inches; Shasta sugar-pine decayed on under side to a depth of from $\frac{1}{2}$ to $\frac{3}{4}$ inches. The redwood ties, laid without tie-plates, under 50-pound rail, are perfectly sound, but the rail has cut down into them from 1 to 2 inches, indicating that the maximum life for such ties in such localities is between five and six years.

In December, 1889, some burnettized ties were laid in the San Joaquin Valley, near Turlock station, in a roadbed composed of sandy loam, under 60-pound rail. An inspection made March 1, 1894, after three years and four months of service, shows a slight decay on the under side. Of the ties of similar timber, but untreated, put in the track at the same time, the burnettized ties were laid, and adjoining them, the white and red fir were completely decayed and removed from the track in August, 1893, after three years and nine months of service. Of the yellow pine untreated ties, 90 per cent. were removed from the track after three years and nine months of service. Of the sugar-pine, untreated, 90 per cent. were rotted down to the danger point and removed from the track after three years and four months of service. The tamarack, red and white fir, yellow pine and sugar-pine, from the eastern slopes of the Sierras, near Truckee, untreated, are more or less badly decayed, after three years and four months of service, the indications being that the maximum life of the best of them will fall somewhere between four and five years. Of the 6 in. x 8 in. x 8 ft.

redwood ties put in at the same time with very small tie-plates, all are sound after five years of service; the plates, which were entirely too small, have bent up considerably, but have not cut down into the ties more than $\frac{1}{8}$ of an inch. The 6 in. x 8 in. x 8 ft. redwood ties that were laid without tie-plates at the same time are cut down under the rail to a depth of two inches, leaving only four inches of sound wood under the rail, and were removed from the track after about three years and nine months of service.

The service life of ordinary redwood ties (which in ordinary roadbeds will last many years without failure by decay) is measured, not by time, but by the volume of tonnage passing over the rails; the speed as well as the weight being a factor in the wear in some proportion not well ascertained. Under average conditions of traffic, redwood ties eight inches wide and six inches thick, laid about 3,000 to the mile of track, and supporting 60-pound steel rail, will endure about 13,000,000 tons of cars and engines passing over the track; this amount of traffic being equal to nearly 30,000 trains, each consisting of a locomotive and tender weighing 60 tons, and 15 cars weighing between 375 and 400 tons, or say, an average of about 16 trains with a locomotive and 15 cars each per day for five years. The average endurance of 7 in. x 8 in. redwood ties is probably somewhere between 17,000,000 and 18,000,000 tons of traffic. Redwood ties are usually condemned as unserviceable when crushed down so as not to leave more than four inches of sound wood under the rail.

Engineering Fallacies.*

There are a number of popular fallacies which, as mechanical engineers, you are likely to encounter in the course of your professional work, and which, as experience has shown, may sometimes lead even able men astray when met with in a new guise, and which are also occasionally not easy to expose or explain to the ordinary observer. As my own experience during the last 30 years has brought me in contact with quite a number of these, I believe that I may do you a service by reviewing some of my experiences, and by calling your attention to some general principles or rules for dealing with such subjects which I have found eminently useful.

In the first place, though it may seem almost superfluous to mention such a thing, every engineer or investigator who undertakes the examination of any new project involving an assumed discovery of new laws or modes of action among the forces of nature, must hold with absolute confidence the great doctrine of the conservation of energy, with its direct corollary relating to what is technically called perpetual motion.

Perpetual motion means the doing of work without expenditure of energy. Strange as it may seem, even in this crude form this fallacy still crops out, and I have within a year encountered it among intelligent and, in a general sense, well-educated people, and I will therefore venture on a word of suggestion as to the best means of treating such cases.

In the first place, as a rule at the present time, even those who suppose they have discovered a means of creating energy, by the use of mechanism, do not go so far as to suppose that a machine can move itself, but only believe that by certain combinations a given amount of energy or work may be developed or increased into a larger amount, and in such cases the best argument to open their eyes to the fallacy of their plan is the *reductio ad absurdum* which will be reached by suggesting the connection to the end of their mechanism where the increased "power" is supposed to be available with the starting point where the small driving force is to be applied.

Thus, suppose an inventor of this sort comes to you with a train of wheelwork, levers, etc., by which one man is to propel a train of cars or the like. It is generally useless to follow out the steps of the mechanism and to point out exactly where a false assumption has been made. If he can appreciate the point at all, he will consider it simply as a matter of detail which he will be able to improve on further study; but if you pick out the final wheel which is to give motion to the whole train of cars, he will, of course, admit that it will turn around with many times more power than a man could exert. You will then propose that this should be connected directly with the crank or level at which the man was to work, when it would manifestly do the man's work and have a large amount of power left over to run the train, thus dispensing with the man's services as soon as he had started the apparatus, and making the machine self-driving.

In curable cases, where no fraud is involved, this will be sufficient; but too often the inventor of a perpetual motion machine is beyond the reach of reason, as was the case with the one who came to Arago for an explanation of the fact that his perpetual motion machine would stop. Not infrequently such plans involve a mechanical fraud by which the driving force is conveyed to the visible mechanism from a concealed source of power. In such cases there is an opportunity of applying close and inclusive observations and some ingenuity in order to detect the fraud.

An admirable instance of this is furnished by the history of a small model in the collection of the Franklin Institute at Philadelphia, which was made about 80 years ago by Isaiah Lukens, at the suggestion of Mr. Nathan Sellers, for the purpose of exposing the fraud involved in the then famous Redheffer perpetual motion machine, in which large sums of money were sunk, as they have been in the "Keeley motor" and like schemes more recently. [The interesting story of this fraud we omit to save space.—EDITOR.]

The driving of a supposed motor through machinery which is supposed to be driven by it is a very general method of deception. Thus I have seen one of these supposed "motors" set up in a shop and connected by belting and shafting with a number of lathes and other machine tools. When everything was running it was impossible by mere inspection to say which may have been the real "driver," since the power might have been transmitted through a hollow journal to any one of a number of points in the system; but you may be quite certain, in such cases, that it is not the supposed "motor" if the conditions of its operation are inconsistent with the doctrine of "conservation of energy." In the case of these fraudulent structures a fortunate accident may aid direction. [President Morton relates the story

*Extracts from an address to the graduating class of the Stevens Institute of Technology. Delivered by President Henry Morton.

of an "electro-magnetic engine" fraud of about 20 years ago.—EDITOR.]

It is a very good plan, when one is requested to look into such a matter, to decline unless an agreement is made that every interior detail of the machine shall be exposed to your inspection. In nine cases out of ten this will relieve you of any further solicitation. On the other hand, to make any agreement not to reveal what you see, as was asked in some cases, as I know, in connection with the Keely motor, is, of course, what no sensible man would do, as it would make it possible to use his name in support of what he might have detected to be a fraud.

It may seem almost needless to say so much on the subject of these gross and conspicuous fallacies; but, while the stock of the Keely Motor Company, in the face of repeated exposures and years of unfulfilled promises, has to-day a value in the market; and when not only such daily papers as are notorious for their lack of truth, honor, or decency, but even respectable journals will publish articles seriously advocating such plans it is evident that even such fallacies need to be met and exposed by the intelligent engineer.

Besides these fallacies, which involve more or less intentional deception, we encounter others which are the result of perfectly honest, but none the less fatal mistakes in observation or experiment. A striking instance of this is furnished by one form of what is known as the aero-steam engine. This was a plan for admitting air into the cylinder of a steam engine at a certain point of the stroke, with a supposed gain in efficiency. A number of experiments were made within my own knowledge with a small engine, or, in fact, model, which seemed to demonstrate conclusively the advantage of this modification. When the air was admitted, everything else remaining the same, the engine made 20 per cent. more revolutions in a minute against the same resistance. This was, in fact, thought to be conclusive as to the advantage of the plan. In further investigation, however, it was found that the boiler supplying the steam engine was so inadequate that it could not fill the cylinder for a rapid stroke, and that thus an "exhaust" or back pressure occurred at each stroke when the engine was running fast. The admission of air at a certain point relieved this back pressure and actually increased the duty, but even when so increased, it was inferior to what it should have been with a well-proportioned boiler.

This is, in fact, a type of a large class of fallacies, one or another of which we encounter almost daily. An efficient or defective machine or process is taken as a standard, and some attachment or modification is made which greatly improves the result, and it is thence assumed that this attachment or modification would be of equal efficiency with machines or processes in a normal condition.

Thus, for example a plan for blowing steam into the ash pit of a boiler furnace was, many years ago, extensively advertised, and very remarkable testimonials were shown as to its actual efficiency. On investigation, it, however, turned out that these cases of success occurred where there was a great want of draft in the furnaces, and any means of increasing it would, therefore, have proved beneficial. The steam blast was, however, a much less efficient way of increasing the draft than any of the well-known methods. Such an example teaches the importance of positive measurements in cases, and the comparison of results with well-known and established standards.

Another example of a practical result apparently proving an efficiency which did not exist, was brought to my attention some time since in connection with a pump which developed a pressure much beyond that which would be estimated by calculation of the force applied on the known area of its piston. It turned out, however, that the piston was so loose that the water passed freely from one side to the other, and thus the pump acted only on the inward stroke, when the piston rod played the part of a plunger whose reduced section, as compared with the piston, accounted for the increased pressure obtained. This condition of affairs was, of course, betrayed by the small amount of water delivered as soon as that was observed.

Such examples as I have just cited teach us also another lesson which may be embodied in a very brief maxim, which is this, "Never make two experiments at once." That is, when you are investigating a subject and estimating the effect of this or that modification or improvement, never make two changes at once, for then you may easily assign the new result to the wrong one of the two possible causes.

Some remarkable examples of this error were furnished some 25 or 30 years ago in connection with what then excited no small interest among steam users—namely, the "anti-incrustator." This consisted of a group of small magnets sustained by an insulating support in the steam space of a boiler, and connected by a copper wire with the shell of the boiler at the other end. This was supposed to prevent the formation of scale in the boiler. If unexceptionable certificates and the testimony of the most reliable witnesses as to practical results could have proved anything, this was thoroughly demonstrated to be an efficient apparatus. For several years it had a most successful career. The stock of the company went up like that of some other more recent companies, and what is more, stayed up, and the anti-incrustators were put into boilers by the thousand. In a few years, however, with wonderful suddenness, the anti-incrustator went out of favor and became a matter of history only.

To explain each instance of its success in operation would be, of course, impossible, but one prominent one will suffice as an example of a large class. This was brought to my attention at the time by Prof. Coleman Sellers, E. D., of Philadelphia, who was one of the few who at that time declined to accept the evidence presented as sufficient to establish a claim itself intrinsically unscientific and improbable. A friend of Mr. Sellers had tried some of these incrustators on boilers of his own, and finding that they ceased to form scale, was convinced, and took a large interest in the company. In conversation with Mr. Sellers he stated this circumstance, whereupon he was asked: "Did you not make some other change at the same time?" "None of any account," he replied. "To be sure, while the boiler was opened to put in the anti-incrustator, we took advantage of the opportunity to disconnect the mud drum, and in place of it connect the feed with a disused boiler alongside, which we employed as a feed water heater."

Now let me point out that one of the chief scale-producing elements in the Philadelphia water is sulphate of lime, which is less soluble in hot than in cold water. With this fact before you, you will at once see that this gentleman had provided a most admirable "anti-incrustator" in his feed-water heater. Here was a large mass of water so heated as to establish only gentle currents, and with a slow circulation, by reason of which the water remained in it a considerable time, and could thus deposit the sulphate of lime, as that became insoluble through the rising temperature. The sulphate of lime also, of course, carried down with it other suspended matters, as we all know it will under such conditions.

Here was a clear case of trying two experiments at once, and of assigning the result to the wrong cause.

Next to these, which may be called mechanical fallacies, we come to a more refined and abstruse class, which may be described as chemical fallacies.

Very many who may be quite able to see that no combination of levers, pulleys, wheels, etc., can make a machine operate itself without external supply of energy or can convert one horse-power into two, are not able so readily to see why a pound of coal may not be able to produce more than its regular equivalent of heat.

One of the forms of this fallacy which is most active at the present day is expressed with charming naïveté in an article appearing March, 1880, in the *Popular Science Monthly*, with the title "Water as Fuel," also in a paper read before the Engineers' Club in Philadelphia, and published in the *American Gas Light Journal* of Feb. 16, 1880. The leading fallacy developed in these articles is that involved in the title first quoted. "Water as Fuel." To any one understanding the actual conditions this title would be even more absurd than such a one as "Ashes as Fuel," "Rest as a Source of Motion," or the like. Water is simply the ashes of a perfect combustion, and is no more capable of becoming fuel than the most perfectly burned ashes from a wood or coal fire.

We should remember that while very few things are so improbable that they might not be established by sufficient evidence, yet that the amount of evidence must be vastly increased when a seeming result is at variance with established laws, and that we will be well repaid for the closest scrutiny and the utmost deliberation by the avoidance of disastrous errors.

Another common source of error and consequent loss is the neglect in the consideration of a subject of what may sometimes seem trifling practical details, but which often control the question of success or failure. Thus, for example, it was seen at quite an early date that a hot-air engine was theoretically a more economical motor (if questions of practical detail were neglected) than a steam engine. Immense sums of money and a vast amount of the highest inventive genius have been expended on the development of such engines for general use. The small practical details of excessive bulk in the machinery, consequent friction, the use of very high temperatures, and the like, have, however, limited the application of the air engine to a very narrow field.

In like manner, theoretically considered, the magneto-electric machine, deriving its exciting field of force from permanent magnets, is manifestly more economical than a dynamo-electric machine whose exciting field of force is maintained only by a constant expenditure of active energy. Yet, as a matter of fact, this theoretical economy is more than balanced by the practical impossibility of securing great intensity of magnetic field with permanent magnets, so that the losses caused by the greater friction and electric resistance present in the larger and more complex magneto-machines are greater than those involved in the constant generation of a magnetic field by the use of an electric current in the dynamo machines.

Some curious fallacies have been presented to the public within the past few years resulting from a failure to recognize that a horse-power did not express an amount of work, but only the rate of doing work. Thus, in order that a horse should develop one horse-power he must raise 33,000 pounds 1 foot high in each minute of the time he is working, and thus if he works for 10 minutes he will do the amount of work represented by 330,000 foot-pounds, or if he works for 10 hours his work will be 60 times as much as that, or 19,800,000 foot-pounds.

About a year ago a machine was exhibited which may be briefly described as a steam engine employing liquefied ammonia in place of steam. In exhibiting it its promoters caused it to raise 33,000 pounds 1 foot high in 10 minutes, and reckoning this as a horse-power, the machine showed a remarkable economy as compared with an ordinary one-horse-power steam engine. None of the promoters or unprofessional spectators seemed to notice the fallacy or to realize that if this engine and an ordinary one-horse steam engine had been working side by side, sawing wood, for example, the steam engine would have done as much work or sawed as much wood in each minute as the ammonia engine did in 10 minutes, and that thus, at the end of the day the work or wood pile of the steam engine would be ten times larger than that of the ammonia engine. In fact, the ammonia engine was not a one-horse-power machine, but a one-tenth horse-power machine.

This incident brings to mind another error which sometimes causes curious mistakes in connection with this same measure of the rate of doing work, *i. e.*, the horse-power. The standard horse-power, 33,000 foot-pounds per minute, does not mean all that a horse can do, but what he can keep up steadily for eight hours a day. In starting a heavy load, or in jumping or running, a horse can develop work for a few minutes at a rate many times as great as this. The same is true of a man. Doing steady work hour after hour a man can develop about one-tenth to one-fifth of a horse-power, according to circumstances, but under the most favorable conditions an ordinarily strong man can develop work for 15 seconds to a minute at the rate of a horse-power. This is on record in "A Treatise on the Construction of Cranes," by J. Glynn (Crosby, Lockwood & Co., London, 1880) but is not, I think generally known.

My attention was first called to it in the following way: I was asked to test a dynamo machine for which the claim was made that it was many times as efficient as the best Brush or Weston dynamos.

I suggested that this was not possible, because the above-named machines had efficiencies of between 80 per cent. and 90 per cent. of a theoretical maximum.

The reply to this led to the following questions and answers:

Q. How much power does an ordinary Brush arc light require?

A. About one horse-power.

Q. How does a man-power compare with a horse-power?

A. As about one-fifth to one-tenth to one.

Q. If then, one man with the dynamo under discussion can run one Brush arc light, will not that prove the machine to be from five to ten times as efficient as a Brush dynamo?

To this I replied that I would like to see it done.

In due time there came to hand a large flywheel mounted on a frame with a pulley for belting to the dynamo and a winch to turn it by. All being arranged it was found that a strong man could, in fact, keep up an arc light with this apparatus for about 50 seconds. As soon as this was demonstrated a dynamometer was attached in place of the dynamo, and this showed that, in the same way, the same man could develop about one horse-power for the same time. It was curious also to observe how completely a man of ordinary strength was exhausted in this or a shorter time when expending energy at this high rate. Experiments narrated in the work above-named showed that men practiced in turning a winch could keep up such a work for from two to three minutes.

This matter of the true measure of a horse-power frequently comes in as an important practical question. Thus, in considering motors for street cars it does not at all follow that a two-horse steam engine or other motor could practically replace a pair of horses. The two-horse engine could exert no more power in starting the car than at any other time, while the pair of horses could, for a few moments, work at the rate of 9 or 10 horse-power, and so accomplish all that was needed where the engine would fail.

There are certain erroneous impressions as to the true relations of force, energy, and work originally derived from our personal sensations which are constantly encountered. Thus, in connection with the early so-called "demonstrations" of Mr. Keely, there was a constant confusion of "pressure" (which is an example of "force") with "work," or its source, "energy," and the public was constantly told that Mr. Keely had discovered a new and vast power, capable of accomplishing vast results in the way of work, because he showed pressures of thousands of pounds on gages.

Work, however, is a compound entity involving not only the exercise of force but also the accomplishment of motion. Work must always be a product of force and distance moved.

A realization of this will save us from the fallacies involved in schemes for the development of "power" from such forces as the expansion of solids or liquids which, though enormous in their intensities, are limited to insignificant distances in their range of motion. The same principle applies as to many proposed forms of magnetic motors where the intensity of an attractive force is offset by the shortness of its range.

Another instance of an erroneous impression arising in the same way is the very common one that the reaction of an escaping jet upon the vessel from which it flows depends in some way on the exterior resistance to said jet. If we stood at the stern of a boat and wished to push the same forward, we could accomplish much more by placing a pole against the shore or some firm obstruction and pushing, than if we had no such resistance to act upon, and, therefore, we feel that if we are trying to propel a boat by driving a jet of water from her stern a better effect will be secured in proportion as the jet strikes against a more and more unyielding resistance.

In fact, however, the energy expended or work done in so propelling a boat depends solely on the energy or work involved in the ejected jet, and is exactly the same whether the jet is thrown above the water level into the air, below the level into the water, or in some other arrangement into a vacuum. A failure to appreciate this well-established fact involved, within a few years, the useless expenditure of a large sum in attempting to drive a boat by water jets expelled at high velocities, under the impression that the greater resistance to the jet after it had left the nozzle, secured by its high velocity, would produce a beneficial effect upon its "reaction" or power to drive the boat.

Foreign Railroad Notes.

A baggage express company, something like those of this country, has been established in Paris, and has made a contract to serve the two stations of the Western Railroad. In the National Railroad Council the subject was discussed, and the opinion expressed that it would prove less of a convenience than in this country, because the passenger must, in any event, wait (or leave his keys) to have his trunks pass the *octroi*, or city custom house. The company was required to agree to deliver all baggage arriving between 6 a. m. and 3 p. m. as early as 6 p. m., and that arriving between 3 p. m. and 6 a. m. by noon, following. A clause in the contract, giving the express company exclusive privileges for five years, was considered of doubtful legality.

The Hungarian State railroads a few years ago established several steamboat lines on the Danube and its tributaries, chiefly to carry traffic to the railroads. To do this it had to compete with an old Austrian steamboat company with a great fleet of boats, which had had almost a monopoly of the traffic. The Hungarians increased their fleet and their service from year to year; but now they have leased the whole fleet to the Austrian Company, making terms for the continuance of exchanges with the State railroads. The Government affirms that the objects aimed at by the establishment of the Hungarian lines are fully secured under the lease.

The Russian Ministry of Transportation contemplates a further increase in the capacity of freight cars up to 800 and 900 pounds—28,900 and 32,400 lbs. As we have noted heretofore, an increase from the old standard of 610 pounds (21,960 lbs.) to 750 (27,000 lbs.), has been made very recently, and was effected usually simply by strengthening the springs. It is said, however, that it is impossible to load the 750 pound cars to their full capacity with most kinds of freight; not even with oats and barley when sacked, and with rye only with great difficulty.

TECHNICAL.

Manufacturing and Business.

The general offices of the Johnson Steel Co. have been removed from Cleveland to Lorain.

The A. & P. Roberts Co., of Philadelphia, has filed a mortgage in favor of the Fidelity Insurance, Trust & Safe Deposit Co., of Philadelphia, to secure \$500,000 of 6 per cent. bonds.

The Whiting Foundry Equipment Co., of Chicago, has recently shipped to the Rogers Locomotive Works, at Paterson, N. J., a No. 6 Whiting cupola with a melting capacity of 10 tons an hour.

The office of Mr. C. L. Strobel, late Consulting Engineer of the Carnegie Steel Co., Ltd., and Chief Engineer of the Keystone Bridge Co., has been moved from the Home Insurance building to the Monadnock Block, Chicago.

The Carnegie Steel Co., Limited, of Pittsburg, Pa., has just placed an order with the Lodge & Davis Machine Tool Co., of Cincinnati, O., for improved 16 in. x 6 ft. standard engine lathes, this order following one for a 42-in standard drill press.

A company has been formed in Forest City, Pa., for building mine cars. The journals that will be used on the cars are the invention of J. F. Gallagher, of Forest City. The officers of the new company are: W. J. Davis, President; Henry Box, Treasurer; J. J. Walker, Secretary.

Messrs. Blackmer & Post, of St. Louis, manufacturers of sewer pipe, have just shipped eight car loads of 30-in. sewer pipe to the city of Rutland, Vt. This is the last of a large order received in November to furnish the city of Rutland with pipe for use in that city to take the place of a 36-in. brick sewer.

The officers of the Alexander Car Replacer Co., of Scranton, Pa., incorporated with a capital of \$100,000 for the purpose of introducing the Alexander car and locomotive replacer are: President, Joseph J. Jermyn; Vice-President, R. B. Williams; Manager, John A. Mears, and Treasurer, John T. Richards.

The Acme Machine Co., of Cleveland, O., report business as improving with them and they have a number of orders on hand, among them a large one for bolt and nut machinery amounting to several thousand dollars to be shipped to Sweden. This is the second order received from the same firm. The first was given during the World's Fair from the exhibit made there.

The Foster Engineering Co., Newark, N. J., has an order for two mammoth valves, 18-in. and 14-in. in size, intended for the Anheuser-Busch Brewing Association of St. Louis. These pressure regulators are of the Foster new "Class W" style, and when completed will be the largest reducing valves ever turned out of their works. Few, if any, pressure regulators of equal size are in service to-day.

The Cleveland Twist Drill Co., of Cleveland, O., has recently added to its factory a three-story and basement brick building 110 ft. x 40 ft., with a tower 18 ft. x 25 ft. The first and second floors are thoroughly fireproof and there is a fireproof vault on each of the three floors for the care of their drawings, templates, etc. The first floor is supported by heavy iron pillars with iron girders and brick arches, the old factory not being large enough to keep up with the rapidly increasing business which necessitated the addition of this large building.

The Hampson Flexible Steam Joint Co. has been organized at Lakeport, N. H., with a paid in capital of \$35,000. The directors are John S. Crane, President; B. F. Drake, Treasurer; M. L. Crane, Secretary; H. S. Young, all of Lakeport, N. H.; A. J. Lane, H. E. Webster, of Manchester, N. H.; W. H. Hampson, Vice-President, and F. A. Barbey, of Boston. F. A. Barbey has been appointed general sales agent with office at 152 Federal-street, Boston. The joint which the company will manufacture is the one which has been handled by F. A. Barbey & Co., of Boston, the past year, and was illustrated in the *Railroad Gazette* of April 27, 1894. It is in use on several railroads and the new Union Station in Boston is completely equipped with it for connecting the surface steam pipes to trains while standing in the station.

John S. George and Howard P. Eells have been appointed receivers for the property of the Bucyrus Steam Shovel & Dredge Co., at South Milwaukee, Wis. This company is one of the largest manufacturers in this country of steam shovels, railroad and locomotive cranes and dredging machinery. The works at South Milwaukee were built in 1892, the company having been located at Bucyrus, O., previously. The South Milwaukee works are an extensive and well-planned plant excellently adapted for the economical manufacture of the heavy machinery made by the company. The business will go on pending the settlement with the creditors. For some time the works have only been running at about half their capacity. Recent orders for heavy machinery will require a largely increased force. The most important of these is a great dredge for Cleveland, O., which is to be equipped with a bucket holding eight cubic yards of material.

Iron and Steel.

The North Steel Works of the Lackawanna Iron & Steel Co., at Scranton, Pa., resumed operations on Feb. 4, after two weeks' idleness. Extensive repairs have been made in the mill, and it is expected that work will continue for some time.

The large machine foundry built at Decatur, Ala., some years ago at a cost of \$120,000, but which has been idle for several years, has been purchased by Chicago men, who will at once overhaul the plant and begin the manufacture of paper car wheels.

A petition has been filed in Common Pleas Court, Philadelphia, asking for the discharge of the receivers and assignees of the Reading Rolling Mill Co. and of Cofrode & Saylor, in order that a reorganization may be effected. The two companies, which were closely allied to each other, went into the hands of receivers about two years ago. J. H. Cofrode and Ellis A. Ballard were appointed receivers for the rolling mill company, and Mr. Cofrode and William F. Harrity receivers for Cofrode & Saylor. The petition states that a plan of reorganization has been effected, the trustee agreeing to issue certain bonds of the companies in payment of these claims.

New Stations and Shops.

The Farrel Foundry & Machine Co., of Ansonia, Conn., has decided to build a new roll and machine shop and has placed the contract for the building with the Berlin Iron Bridge Co. The building will be 104 ft. x 260 ft. long, constructed entirely of iron, brick and glass. The roof will be of copper. The Schenectady Gas Light Co. has placed the contract for a new gas house roof with the Berlin Iron Bridge Co.

The town of Temple, Tex., has raised a bonus asked by the Gulf, Colorado & Santa Fe, for locating shops of that company at that town. The railroad company has prepared plans for a roundhouse, shops, station and office building, and it is said will spend nearly \$200,000 on improvements at Temple.

The machine shops of the Chester & Lenoir railroad are to be located at Lincoln, N. C., so it is reliably reported.

Interlocking.

The National Switch & Signal Co. has been awarded the contract for putting up a signal plant at East Boston. This plant is to operate and control the new terminals at that point of the Boston, Revere Beach & Lynn Railroad, and will be a 40-lever machine with torpedoes, electric slots, light indicators and all the latest improvements now made by that company. This company has also been awarded the contract for putting in a system of signals at Catlettsburg, Ky., for the Chesapeake & Ohio at the crossing of an electric line. The apparatus furnished for this crossing provides that the levers shall be operated by the conductor of the motor car and that he cannot leave the signal tower until he has left all the levers in the position in which he found them upon entering the tower.

Hall signals have been placed on both sides of the Neches River Bridge of the Southern Pacific, near Beaumont, Tex. There is a home and a distant signal at each end. They work automatically by the passage of the trains and are also interlocked with the drawbridge.

Electric Lighting.

The Chesapeake & Ohio completed a few weeks ago a charging plant in Richmond, Va., for charging the storage batteries for electric lighting of cars. The cars on the Eastern Divisions are now being lighted by the Silvey storage battery system which we have described at considerable length at various times.

A 1,000-H. P. Electric Generator.

The Elwell-Parker Electric Co., of America, is now building for the Cleveland City Railway Co. a 1,000-h. p. direct connected generator for running street cars that is to be driven by a triple expansion condensing engine of the marine type manufactured and supplied by the Globe Iron Works of Cleveland. The speed of the generator and engine is to be 110 revolutions a minute. This machine is designed to work at an efficiency as high as anything heretofore obtained, if not higher. The maximum overload capacity is, we understand, to be 2,000 h. p.

Johnson Signal Company.

Edward S. Savage was appointed receiver of this company on Feb. 4, by Chancellor McGill, at Jersey City, upon the application of Henry Johnson, the company's General Manager. This company was organized in 1888 with a capital stock of \$150,000. The company's business was largely based upon the patents of Charles R. Johnson (deceased) and Henry Johnson. A few years ago a little more than one-half of the outstanding capital stock was purchased by the Hall Signal Company and a new Board of Directors, representing the controlling interest, was elected. Mr. Johnson and his interest was not represented in the Board of Directors. On Jan. 18, the officers of the company executed a mortgage upon all its property for \$52,000 to the company's Secretary, George W. Miller, as trustee. It is stated that this mortgage was made to secure certain favored creditors, although the total debt of the company is stated to be \$110,000. Owing to alleged formal defects and for other reasons, it is claimed that this mortgage is invalid; that in any event it will be contested.

New York Rapid Transit.

The Rapid Transit Commissioners of New York at their meeting of Feb. 5, passed resolutions to the effect that the extension of the facilities of the elevated railroad as suggested by the Board of Experts would not conform to the requirements of the act under which the Commission is working; and, moreover, that it would endanger the possibility of the construction of a road to be built and owned by the city. The Commissioners do not feel at liberty to do anything that will have this effect. At the same meeting there was the familiar old talk about contractors who are ready to build the new road and to operate it. We are not at all certain that the Expert Board's suggestion of a possible arrangement with the Manhattan Company could have been carried out, but we regard it as an immense misfortune to the city of New York that no effort has been made to carry it out.

A Railroad with Gas Motors.

At the last meeting of the Maryland Legislature a charter was granted to Thomas S. Hodson, and others, to build and operate an electric railroad in Somerset County. The project contemplated a line about three miles long, between Crisfield and Abe's Hole, on Tangier Sound, and a second line from the latter point up through the peach and truck district northward for about 15 miles. A company having been incorporated, efforts were made to secure capital and build the short line. Only a part of the required stock was subscribed in Crisfield, however, and assistance was sought elsewhere. Chicago and New York capitalists became interested in the project, and the New York Standard Construction Company has taken charge of the work.

One condition attaching to the later subscriptions of stock was that gas engines should be used for motive power. This method of propelling cars has been em-

ployed with some success in Germany, and plans for the motors and engine equipment were brought from Berlin. On the authority of the Baltimore stockholders arrangements have been completed, and contracts signed for grading, laying track and building the rolling stock, and if present expectations are realized, the road will go into operation next summer.

The short line to be built and equipped first will depend principally upon the traffic in oysters, crabs and fish, and the plans of the projectors contemplated combination trains for both freight and passengers at regular intervals during the day. If the extension should be added the line will be chiefly employed in bringing fruit and truck down to Crisfield for shipment by boat to Baltimore and Philadelphia.

Pintsch Gas Works at Chattanooga.

The branch works of the Pintsch Gas Company, located at Chattanooga, Tenn., in April, 1893, have a capacity to make, compress and furnish 25,000 cu. ft. of gas a day. The plant supplies gas to all divisions of the Southern Railroad entering Chattanooga, the Queen & Crescent, and to sleepers on the Nashville, Chattanooga & St. Louis Railroad. The gas receivers are charged with sufficient gas for a trip to Washington, 1,344 miles, and return, and to New Orleans and return, 984 miles. In December, 1893, these works sold 53,827 cu. ft. of gas, and in December, 1894, 236,353 cu. ft., a gain of over 300 per cent.

Hall Signal Company.

By a decision of Justice Patterson, of the New York Supreme Court, this week the company is freed from an annoying attack on its management and its credit. A. S. Nash and others, representing 113 shares of stock, applied for a restraining injunction upon the officers, alleging that the funds of the company and its shares were being dissipated. Judge Patterson refuses the injunction and holds that no evidence was presented to justify the granting of the motion for one. On the chief point of contention, namely, that certain shares of stock had been issued by the officers without consideration, Judge Patterson holds that the evidence utterly destroys such charge. He holds that this stock is shown to have been issued for valuable patents. The charge that any of the persons who hold this stock to-day were guilty of fraud the Court finds is without any foundation.

Utilization of Railroad Scrap Material.

The Master Mechanics' Association issues the following circular:

Your committee to report on "Utilization of Railroad Scrap Material and the Best Method of Handling It," desires information upon the subject from every member of the Association. This may take the form of a general statement covering the treatment of the scrap pile as a whole, or a detailed account of your method of utilizing some part of the material usually found therein, or preferably both. Figures showing the saving in cost, or the reverse, resulting from the working over of scrap as compared with the cost of new material with the scrap value of the old material deducted will be especially desirable.

A Passenger Cableway.

A recent number of *Engineering* (London) contains illustrations and a short description of a cableway for passenger traffic recently erected over what is called the Devil's Dyke at Brighton. The suspension cable is carried over two towers, being anchored by eyebolts into the sides of the gorge. This cable is 1,200 feet long and the span between towers is 650 feet, the dip of the cable being 26 feet. From this cable are suspended two horizontal cables for carrying the car. These are hung from the suspension cable by steel rods one inch in diameter. The track cables being horizontal the pull is the same whatever the position of the car. The car is hauled by an endless cable driven by an oil engine. The greatest elevation of the car above the lowest part of the valley is 230 feet. Since the opening of this bridge last October some 4,000 passengers have been carried.

Locomotives for Japan.

Messrs. Neilson & Company, of Glasgow, have just filled an order for 12 locomotives for the Nippon Railway Company of Japan. These were ordered on the 26th of September and the penalty for delay in delivery was £100 a week, for each engine, after the contract date. The contract called for delivery of the first four Jan. 15, the second four Jan. 29, and the third four Feb. 12. The first engine was actually turned out 65 days after the order was received. The first four were tried under steam and accepted five days later and engines 5 to 8 were tested on the seventy-seventh day from the receipt of the order. The final four were tried under steam and tested Dec. 19, or 84 days from the receipt of the order. The whole order will be shipped considerably short of the time specified for the first delivery. *The Engineer* thinks this establishes a record in locomotive building, and probably it does for the Scotchmen.

The Canadian Soo Canal.

The *Marine Review* learns that the defects reported in the masonry of this canal are above the lock, where a cut was made for the approach through drift and the underlying sandstone rock. A timber crib was built up to near the low water line and a masonry retaining wall built on the crib to the desired height. When the back filling was nearly completed it was found that the cribs and wall were sliding into the channel, the greatest movement being about two feet. Props, or shore pieces, have been placed from the bottom of the canal to the front lower angles of the cribs to stop the movement, and the spaces between the shores filled with concrete. It is feared that vessels will strike their bilges on these props

and also injure their wheels. It would have been better to have adopted the safer methods of American engineers and built up the retaining walls from the rock, as was done in the United States Canal.

A New Type of Water Tube Boiler.

One of the latest of the water tube types of stationary boilers is the Caball. It is simple, and promises to be easily repaired. The water tubes are straight and nearly vertical. At the top they are joined to a drum through the middle of which the smoke flue passes. At the bottom the tubes enter a mud drum that is below the fire. This drum has a man-hole and a blow-off pipe. The slight inclination of the tubes from the vertical gives a conical space, which is sub-divided by a deflector, so that the gases from the fire are made to pass in and out between the tubes. The furnace is peculiar in that it is wholly outside of the boiler, and has a lateral connection to it. It is, in fact, a sort of combustion chamber, with a fire brick arch over the fire, and with a small bridge wall, so that there are no direct heating surfaces on the boiler. The design is very compact, and can be easily kept free from scale. It is made by H. R. Collins & Co., Pittsburg.

THE SCRAP HEAP.

Notes.

A man arrested at Logansport, Ind., recently had in his possession 300 counterfeit railroad tickets reading from Indianapolis to Mobile.

The bill now before the Illinois legislature to provide for the expenses of the militia during the strike of last summer appropriates \$254,721.

The Pennsylvania Railroad has taken off a number of passenger trains on the short branch from Philadelphia to Germantown and Chestnut Hill, owing, it is said, to the diversion of business to new street car lines.

A circular has been issued by the Jacksonville, St. Augustine & Indian River railroad offering to furnish vegetable seeds free to all patrons of the road whose crops were destroyed by the recent cold snap in Florida.

The Michigan Central serves lunches in baskets to passengers on some of its trains, the orders being taken by a man some time in advance and telegraphed ahead. This plan was in vogue on the Boston & Albany several years ago.

In a court at Bay City, Mich. recently a railroad company paid \$8,500 damages in a suit brought on behalf of a child 18 months old, who had been run over at a street crossing by a freight train, running backward, and had his feet crushed.

Freight train crews on the Charleston Division of the Northern Pacific now run through the whole length of that division, from Glendive to Billings, Mont., 215 miles, and it is said that the men on the division between Mandan and Glendive will be required to run about the same distance.

Mr. Vilas, United States Senator from Wisconsin, formerly Postmaster-General, has proposed in Congress an amendment to the post office appropriation bill directing the Postmaster-General to buy or build postal cars for all the lines in the country or for such part of them as he may see fit.

The *Journal* of the Brotherhood of Locomotive Engineers denies the recently published statement that the membership of the brotherhood has seriously fallen off during the past year. It states that the membership at present is about 34,000 or within 1,000 of the highest figure that it has ever reached.

An ambulance car, fitted with a motor to run upon electric railroads, has been presented to the city of St. Louis by Mr. John Scullin, President of one of the street car lines there. It is proposed to put it in charge of the City Health Department, and to have it make regular trips through different parts of the city.

The palace car, Jeannette, built several years ago by L. J. Harris, is being refitted at Brightwood, and will pass into the hands of the American Palace Car Co. This car, which was described in the *Railroad Gazette* of November 28, 1890, has sleeping berths which are dropped beneath the floor during the day time. The Harris Palatial Car Company has gone to pieces.

The Board of Aldermen of Brooklyn, N. Y., in passing a recent ordinance for the regulation of traffic on Atlantic avenue in that city included in it a provision that gates at intersecting streets should not be lowered oftener than once in 10 minutes. Trains of the Long Island railroad run on this avenue and these gates at cross streets are lowered on the passage of each train. The ordinance would be equivalent to a requirement that trains should not be run oftener than once in 10 minutes. The Mayor vetoed it.

The through passenger train of the Southern Pacific was stopped by robbers on the night of Jan. 30, near Wilcox, Ariz., and a safe in the express car was blown open. There were four or five robbers and it is said that they got \$10,000 in silver. The through train of the Atchison, Topeka & Santa Fe was stopped by robbers near Sylvia, Kan., on the night of Feb. 4, by two robbers. It appears that they did not get into the express car, but took all the passengers' valuables. The train was held an hour and 10 minutes.

Mileage Figures of the Pennsylvania.

The Pennsylvania Railroad Company has just issued a statement of miles of road owned, controlled or operated east of Pittsburg and Erie. The roads are divided into divisions, and the grand total shows an increase of first track of 31½ miles, and the second, third and fourth

track, an increase of 3½ miles, sidings an increase of 31½ miles, making a total increase in trackage of 67 miles. The Pennsylvania Railroad east of Pittsburg and Erie, comprises a total trackage of 8,004 miles. This trackage includes the united railroads of New Jersey, which take in all the lines east of Philadelphia, excluding the West Jersey and Camden & Atlantic, and the New York & Long Branch Railroad, which is operated jointly with the Central of New Jersey Railroad Company. The Pennsylvania Railroad division leads the list, with a total trackage of 3,544 miles. This division has 1,668 miles of first track, 544 miles of third track, and 134½ miles of fourth track, with 95½ miles of sidings. The New York division of the United Railroad of New Jersey is now practically a four-track road, as there is 86 miles of it out of the 90 which has the four tracks. The United Railroad of New Jersey division has a total trackage of 1,180 miles. The Philadelphia, Wilmington & Baltimore comes third, with a mileage of 1,047. The Philadelphia & Erie is fourth, with 914 miles, the Northern Central fifth, with 939½.

A Hundred Train Robberies.

The following table has been compiled by the *Express Gazette*:

Year—	Passenger trains held up.
1890.....	12
1891.....	16
1892.....	16
1893.....	33
1894.....	27

Total number of trains "held up".....	104
Total number of lives lost.....	27
Total number of persons injured.....	27

Electric Street Work.

The Directors of the Hartford Central Railway & Electric Co. awarded several contracts recently. The Berlin Iron Bridge Co. has been awarded the contract for the steel bridge over the consolidated road for the proposed line to Hartford. This same company has likewise been awarded the contract for two iron ladders and platforms to be used around the boilers at the company's plant. Contracts were also awarded to them for the bridge over the brook near the town lines in Berlin, and repairs for another bridge on the Berlin line. These contracts must be finished by March 1.

Fences in Massachusetts.

A press dispatch from Worcester, Mass., says that a force of men was set to work at 11 o'clock on a recent Saturday night building a fence around the Union Railroad station in that city, in compliance with the law which specifies that to maintain title to land individuals and corporations must enclose their holdings at least once in twenty years. Indignant citizens protested, but City Solicitor Hopkins gave it as his opinion that the Boston & Albany had an undoubted right to erect the fence, which must remain standing for twenty-four hours to meet the requirements of the statutes. Street traffic and the passage of the electric cars in Washington square were impeded.

A Lake George Incline Railroad.

The Horicon Improvement Co., has been incorporated at Albany, N. Y., with a capital of \$150,000. The company will build a cable road from Lake George village, N. Y., to Prospect Mountain, a distance of 72,000 ft., and will own a hotel at Lake George, and build and maintain cottages. The directors of the company are Walter M. Peck, Harry M. Peck and A. B. Colvin, State Treasurer, all of Glen Falls. Associated with the directors in the enterprise is the Otis Elevator Company of New York city, the builders of the Catskill Mountain Cable Incline road. The company has already started fifty men at work building the road.

Chicago Main Drainage Contracts.

Bids were opened a few weeks ago by the Chicago Main Drainage Canal Board for the reletting of Section F, which was forfeited by Ricker & Lee. The firm took the contract at 23 cents per cubic yard, and was among the leaders in the demand for a reclassification and failing to secure that, virtually abandoned the work. The bids were as follows, the sum total being given: P. C. Weir, Cincinnati, \$183,585; John McKeckney & Co., Chicago, \$206,488; John McAnrow, Chicago, \$209,550; Campbell, Dennis & Co., Joliet, \$209,685; C. Lowe Construction Co., Chicago, \$237,136; J. W. Byrnes, Galveston, Texas, \$224,733; Griffith & McDermott, Chicago, \$237,136; E. D. Smith & Co., Romeo, \$249,413; Halverson, Richards & Co., Lemont, \$259,250. No award of the work has yet been made.

Surprise Ticket Examiners.

English railway companies are quite cognizant of the fact that a more strict code of morality on the part of passengers would materially affect, for the better, their coaching receipts. The experience of one company, which employs traveling surprise ticket examiners, shows that only in one train out of every three examined recently were the tickets correct. Nearly 75 per cent. of the delinquents were traveling without tickets of any kind, and others were using tickets out of date, tickets for other routes, and third class tickets in first class compartments. *The Railway Engineer* (London).

The Kentucky Separate Car Law.

Under peremptory instructions from Judge Barr the jury in the United States Court at Owensboro, Ky., on Feb. 4, found a verdict for one cent and costs against the Louisville & Nashville Railroad in the separate car case. The suit was brought by the Rev. W. H. Anderson, colored, of Evansville, for \$15,000, but was really to test the law of Kentucky requiring railroads to run cars for colored persons separate from those furnished for whites. Judge Barr decided last summer that the law was unconstitutional because it affected interstate commerce. The railroad company then contended that it had a rule requiring the separation of white and colored passengers aside from this law and asserted that the rule was a reasonable one. Upon this the issue was joined and the verdict rendered. Judge Barr's instructions left the jury only to determine the amount of damages. Immediately upon filing of the verdict the attorneys for the railroad gave notice of an appeal to the Supreme Court of the United States. A writ of error will be prepared at once on the judge's instructions and also on the ruling declaring the Kentucky law unconstitutional.

Newton Grade Crossings.

The city of Newton, Mass., has come to an agreement with the Boston & Albany in regard to the separation of the grades of street crossings in that city, a problem which has been under consideration for several years. The line of the railroad through that city lies in a thickly populated district for about five miles, beginning at Faneuil, six miles from Boston, and extending to Riverside, 11 miles from Boston. The negotiations looking to a change in grades have been delayed because the city

strenuously insisted on the depression of the tracks, while the railroad company desired to raise them. By the plan agreed upon they will be depressed, and the city, at the same time, proposes to widen Washington street, an important thoroughfare lying parallel to the railroad, and a short distance north of it. To do this the legislature will be asked to empower the city to take any or all of the land lying between the street and the railroad, and this will be utilized for temporary tracks during the construction of the tracks on the new level. There are four main tracks on this section of the road, five or six stations and several grade crossings. It is said that for most of the way the sides of the cut for the new line can be sloped. The city asks that the State furnish the money for that portion of the expense not borne by the railroad company, the city to pay its share in the shape of annual installments to the State Treasurer for 40 years.

Pay Up.

A press dispatch from Omaha says: Judge Sanborn, last December, made an order to the effect that any employee of the Union Pacific Receivers against whom a judgment for debt was entered should, on receiving transcripts of the same, pay the clerk of the court at least 10 per cent. of his earnings monthly to be applied to the judgment. If the judgment debtor fails to pay this amount, then, on 10 days' notice, he should show cause before a special master in chancery why the entire amount of his monthly earnings for the succeeding month should not be paid to the clerk of the court, as a punishment, presumably, for his negligence. Special Master in Chancery Cornish has enforced this order for the first time, and there is great indignation in regard to it among the labor unions.

P. Sullivan's Little Game.

A press dispatch of Jan. 29 tells of an Arizona man who seems to be up to date. It comes from Solomonville, and says: P. Sullivan owns land over which the Gila Valley, Globe & Northern built its railroad track last summer, according to Sullivan, in his absence and without his permission. On Sunday he erected a frame building on the track, surrounded by a wire fence. He moved his family in and the next train was obliged to halt. When William Garland, President of the railroad, who was on the train, attempted to remove the fence, Sullivan leveled a shotgun at the President, warning him to keep hands off, advice which Garland promptly followed. The train was obliged to return to Solomonville, and a warrant was issued for Sullivan's arrest.

Colored Porters on Street Cars.

The foregoing caption is not a statement of fact, but is suggested as a possibility by reading the following paragraph in a newspaper printed in Boston, where, as every one knows, the people are about as nice as nice can be: "The West End Street Railway is experimenting with a new method by which passengers may notify conductors when it is desired to stop the car. A car has been equipped with a series of electric buttons attached to the frame-work of the windows, which, by touching, a gong is rung over the conductor's head on her platform. So far the scheme has worked satisfactorily and in a few weeks there will be about 300 of the cars supplied with the electrical buttons. All the new cars ordered will have the improvement."

A Hopeful View of the Situation.

A mistaken impression may prevail in some quarters as to the extent of the depressing effect of the injunctions recently served by the Westinghouse Air Brake Company upon the New York Air Brake Company. It was erroneously reported at the time that the day the injunction was served the New York Air Brake Company let 80 of its employees go. The company let 25 employees go—that portion of its help who were employed in the triple valve department. It is only the triple valve which the New York company is restrained from making, and this does not make as much difference in the business as might be imagined, for the reason that the most of the business for the past year has been in the manufacturing of locomotive equipments. Very little car building has been done by the railroads; consequently the injunction, while it of course hurts the company somewhat, does not seriously affect it. The company is manufacturing the pumps which are used by fire extinguisher companies throughout the United States, for automatic sprinkler systems. They have a number of orders in their blacksmith shop. They are now making 15 sets of very heavy brakes for the Louisville & Nashville Railroad. Before they released the 25 men in the triple valve department they had 501 men, so one can see that the force has not been cut to a great extent.—*Watertown Times*.

Where They Don't Want a Railroad.

The effect a railroad would have upon the wages of those of us whose only income is the money received from daily toil is plain. The railroad would not only absorb the money upon which our freighters now subsist, but dump into our county a large addition to our already sufficient number of laborers and reduction in wages would surely and speedily follow the advent of a railroad. Wool excepted, the products of Crook county can and do walk to market, gaining flesh on the way. Our mutton sheep go to California and Nevada, and while en route accumulate flesh sufficient to be ready for market, and our beeves are grazed to feeding grounds in Wasco or Union counties with slight expense and loss of flesh.

Does any one suppose that a railroad would raise the price of a single product raised upon the farms of Crooked River, Willow Creek, Ochoco and Bridge creeks, and their tributaries? If so, what product? What are the facts in the case? In the last eighteen years our wheat has brought an average of 83 cents per bushel. In what direction, may we ask, could our wheat have been shipped to have brought more money during those eighteen years, provided two railroads, both encircling the globe in different directions, had had one of their cross roads in Princeville? No better illustration is needed of the utter fallacy of the doctrine that the only hope for a millennium to dawn upon the grass-covered hills of Crook county is through the railroad agency. As far as wheat is concerned, it is higher in Crook county at the present time than at any point on the Pacific coast, and, without boasting, we may add that the residents of this county have the money to buy it and the appetite to eat it.—*Princeville (Or.) Review*.

Spanish American Notes.

The Chilean Government has sent a commission headed by Senor Domingo Victor Santa Maria, Director General of Public Works, to Coquimbo to inspect the Coquimbo railroad, with a view to its purchase by the State. A corps of State engineers has also been sent to survey a route for a new line from Curico to Quenes.

The Buenos Ayres and Valpariso Transandine railroad has finished the sixth section of its line as far as Punta de las Vacas, and is running trains from Mendoza to that point on Mondays, Wednesdays and Fridays.

The Venezuela Central Railroad Co. reports an insufficient amount of traffic to maintain the costs of operating it, and only 19 kilometers out of a total of 40 kilometers completed are kept open. There remain 8½ kilometers to be built to complete the line. The government is in arrears to the company on account of its promised subsidy to the amount of \$730,000.

A convocation of all classes of Cuban railroad employees in Havana, during the month of December resulted in the organization of an association for mutual improvement and for assistance in case of sickness or injury.

The Canadian Canals.

During the fiscal year ending June 30, 1894, the Dominion Government expended \$1,640,483 on the St. Lawrence canals; \$1,316,529 on the "Soo" canal; \$3,412 on the Trent River Navigation; \$64,345 on the Lachine Canal; \$1,571 on the Welland Canal.

Standard Time in Australia.

According to a press despatch from Sydney, N. S. W., the Australasian colonies adopted Standard time on Feb. 1, by which Victorian time will advance 20 minutes, making Melbourne, Sydney and Brisbane ten hours; Adelaide, nine hours; Perth, eight hours and Wellington eleven hours ahead of Greenwich time.

Profit Sharing.

Soap-making must be a more profitable business than carrying soap. We have received an invitation through the courtesy of Mr. McDonald, Manager of the Freight Department, to the meeting of the employees of the Proctor & Gamble Co., at Ivorydale, near Cincinnati, and from a note on the programme it appears that 403 employees received in extra dividend 12 per cent of the wages paid to them the last six months. The programme includes music and an address, the distribution of the dividend, the election of pension fund trustees, and ends with dancing. We should suppose they would dance.

A Magic Collapsible Sleeping Car.

Patents have been issued to Mr. L. F. Ruth, of Connelville, Pa., for a combined parlor and sleeping car, most of the furniture of which can be folded up and put out of sight. The inventor's idea is to use air bags for all of the mattresses, pillows and chair cushions, and inflate them by means of the compressed air pipes of the cars, which are supplied from the engine. These pipes will be fitted with convenient branches in all parts of the car, with valves so arranged that the mattresses, etc., can be inflated very quickly. The mattresses can be emptied and collapsed in the day-time and the chair cushions at night. The invention is further described as follows:

The sections have each an upper and a lower berth and two chairs, with the mattresses and bed cushions of the berths and the cushions of the chairs made of air-tight bags of soft rubber. The main compressed air pipe is under the floor and has three branch pipes for each section; one supplies air to the two chairs and the other two to the upper and lower mattresses. When the chairs are in use the berths are housed in the sides of the car, and their supports, to which they are connected at the outer ends, are folded and lie flat on the side of the car. The sections are separated by partition curtains on vertical spring rollers made of woven wire covered with cloth. It is claimed that it takes less time and trouble to convert the parlor into the sleeping car than it does to make up the beds of an ordinary sleeping car. There is a large reduction in weight over the ordinary sleeping car.

We beg that our foreign exchanges will be discriminating in the use they make of this item. This is not yet standard American practice.

Rails on Highways.

According to the German periodical *Die Strassenbahn* an interesting experiment is about to be tried on the highway connecting the towns of Stade and Hollern, in the province of Hanover. Flat iron rails, somewhat similar to street car rails, are being laid down, but, unlike these, are designed for the use of ordinary wagons, both as a means of lightening the labor of draught horses and of reducing the cost of road repairs. The plate rails are to be laid in a beton foundation.

A New Underground Railroad Project for Berlin.

The number of underground railroad projects for the city of Berlin is multiplying. The latest one, advanced by Mr. N. Grauel, provides for a sort of gravity road, such as has been often suggested for New York, there being a heavy down grade for the first section of the line, then a level stretch, and then an up-grade. The cars are also to be equipped with electric motors, so as to permit the maintenance of a practically uniform rate of speed on the whole length of line. There is to be a series of these three-part sections, each with a station at each end, at which the passengers would have to change cars, and on each of these sections there would be only one car. There would be only a single track. The inconvenience of changing cars, it is claimed, would be more than counterbalanced by the advantage of great speed, the latter being intended to be at the rate of about 75 miles an hour. The length of each section would be about three-fifths of a mile, but could be made twice as long if desired. The cars would be about 36 feet long, and would have six compartments, each capable of accommodating eight passengers. Stations and cars would be lighted by electric incandescent lamps. It is proposed to have one central passenger station from which a number of lines would radiate. According to the *Zeitschrift* of the Austrian Engineers' and Architects' Society, the projector of the enterprise offers to build and operate a trial section.

Paying Central Pacific Bonds.

The first bonds issued 30 years ago in favor of the Central Pacific Railroad, known as the six per cent. subsidy bonds, became due on Jan. 16, and the United States Treasury, under the law, began their payment at Washington, on that day. The first lot due amounts to \$2,362,000 and interest since Jan. 1, 1895. No more of these bonds will be due this year.

Gun Carriage Contract Divided.

General Flagler, Chief of Army Ordnance, has decided to divide the contracts for the 10-inch gun carriages required for sea coast defence, in order to secure their early delivery, as the guns are ready. He has awarded four carriages to the Pond Machine Co., of New York, and four to the Bethlehem Steel Co., and will probably give one or two to the William Cramp & Sons' Ship & Engine Building Co., of Philadelphia.

Contracts for Dredging.

Bids for dredging along the inland waterway of the Delaware & Chesapeake Canal were opened recently at the United States Engineer's office at Wilmington, Del. as follows: Virginia Dredging Co., 24.4 cents per cubic yard; John Jacoby, James Murtagh and F. C. Monroe, each 25 cents; Delaware Construction Co.,

35 cents. The work will involve an expenditure of about \$27,500.

Castings for Cars.

Manufacturers of castings for car work report an important change now occurring in their business. Gray iron castings are being superseded by either malleable or steel castings. In an important contract for freight cars which was recently placed the specifications did not enumerate a pound of ordinary cast work, but called for either steel or malleable castings. Even the axle boxes were to be made of malleable iron. Makers of car castings are therefore putting themselves in position to meet the changing requirements of this trade. Some will pay more attention to steel castings than hitherto, while others have either arranged to make malleable castings or will soon do so. Should the car-building industry revive, of which there are now excellent indications, the foundrymen will be in the best position to reap full benefits from it who have in the meantime prepared themselves to make a better product than the ordinary gray iron casting. This is another illustration of the tendency to use better materials when prices fall.—*Iron Age*.

The Versatility of the Trolley.

In Minneapolis and other cities, officers of the roads have private trolley cars, sumptuously fitted, in which they take their friends about town, and in Boston and Toronto "palace" trolley cars can be hired for theater or dinner parties, excursions, etc. On over 62 electric street railroads the United States mails are now carried; sometimes in especially-equipped postal cars; and freight and express service over electric lines is rapidly extending and is now being furnished on nearly 50 separate roads. In New Haven, special trolley cars are permitted to carry raw materials to manufacturing and finished products to the railroad; at Spokane, trolley freight cars handle grain in bulk, and about many mines and factories special trolley lines transport materials. In Baltimore electric locomotives, operated on the overhead system, will soon propel regular passenger and freight trains through the new Belt Line tunnel. In Pittsburgh, a contractor has used a special trolley line for hauling clay and gravel to the dump; in many cities snow is swept from the tracks and streets are watered from curb to curb by trolley cars, and in Toronto these same cars haul away the city's garbage. Trolley funeral trains, specially fitted up, are now to be hired, and in St. Louis trolley ambulances convey patients to the city hospitals.—*Engineering News*.

Yellow Pine in Car Building.

The Pullman Company is now making up an order of 200 freight cars, which are to be constructed exclusively of yellow pine—trunk beams, sills, and siding. In regard to the latter item there have been some peculiar developments of late, owing to its very low price; \$13.50 has been a common price for yellow pine car siding this fall, as against \$27 as the lowest figure on white pine; but these prices are of but little question as to preference, though there are some objections to yellow pine for this purpose, but they are nominal rather than real. One is that under the trying conditions of freight car service and owing to the exposure to the suns of summer, the pitch will sometimes exude from the yellow pine siding; but it is said that by painting the cars a dark brown, the working out of the pitch does not injure their appearance as it would in some other colors, and this is really about the only objection to the material.

Another advantage claimed for the use of yellow pine car siding is that it greatly strengthens the car, stiffening it materially, so that its weight is more than compensated for by increased strength. However, the railroad companies and car builders are showing themselves disposed to try any material that is offered for car building with promise of economy and usefulness.—*Timberman*.

Dominion Government Railroad Subsidies.

The total subsidies paid by the Dominion Government in aid of railroad construction during the fiscal year ending June 30, as shown by a return just issued, were \$1,229,885. The following was the distribution: Atlantic & Northwestern, \$186,600; Baie des Chaleurs, \$95,825; Buctouche & Moncton, \$34,580; Ironclad, Bancroft & Ottawa, \$32,000; Kingston, Napanee & Western, \$13,932; Lake Erie & Detroit, \$220,331; Lotbiniere & Megantic, \$35,200; Montreal & Ottawa, \$23,640; Montreal & Western, \$119,486; Montford Colonization, \$32,000; New Glasgow Iron & Coal, \$5,454; Ottawa, Arnprior & Parry Sound, \$101,120; Ottawa & Gatineau Valley, \$58,376; Orford Mountain, \$52,800; Phillipsburg Junction, \$18,638; Quebec & Lake St. John, \$81,600; Susway & Okanagan, \$640; Thousand Islands, \$14,000; Tobique Valley, \$19,341; United Counties, \$88,973. The total government grants to railroads which have been placed under contract and paid since the bonus system was introduced amount to \$39,736,132, and the total grants to railroads not yet placed under contract represent \$4,791,000. This is all without reference to the amount expended by the Dominion Government on its own roads. The total amount expended on capital account on account of government railroads during the year was: Intercolonial, \$102,899; Cape Breton, \$222,233; Oxford & New Glasgow, \$112,382.

Statistics of Traffic in Brooklyn, N. Y.

The following statement of passenger traffic in Brooklyn, a city where elevated and surface lines have recently come into sharp competition by the adoption of electricity as a motive power on the surface roads, is published in the *Street Railway Journal*.

Number of passengers carried by Brooklyn railroads during the year ending June 30, 1893 and 1894:

Surface lines.	1894.	1893.
Brooklyn Heights system	92,335,282	90,952,897
B'klyn Queens Co. & Suburban	10,776,900	11,588,280
Brooklyn Traction system	19,877,290	17,632,894
Brooklyn City & Newtown	14,664,083	11,994,772
Coney Island & Brooklyn	5,557,722	5,667,738
Van Brunt Street	1,301,703	1,408,296
Total	144,512,990	139,244,859
Increase	5,268,131	
Elevated companies.		
Brooklyn Elevated R. R. Co.	34,233,697	38,110,376
Kings County Elevated R. R. Co.	14,472,150	18,554,033
Total	48,705,847	56,664,409
Decrease	7,959,562	
Total surface and elevated	193,218,837	195,910,268
Decrease	2,691,431	
* Passengers who paid fares.		

It is seen that while traffic on the surface lines was materially greater in 1894 than in 1893, there was a falling off in that of the elevated lines which more than offset the increase, so that the total number of passengers carried was 2,691,431 less in 1894 than in 1893.

Useful Tramps.

"Every freight train leaving South Florida, north-bound, has perched upon the box-cars from one to a score of tramps," said a railroad man. "What's the reason they are not put off?" asked one of the crowd. "Why, the train hands like to have them along. When a freight

train stops at a wood rack the tramps are all whistled up and are put to work, chunking in the wood like good fellows, while the train hands boss the job. Wooding-up ordinarily consumes fifteen minutes. Put a dozen tramps at the work, and you'll have it done in two minutes. There's thirteen minutes saved."—*Jacksonville Times-Union*.

The Baltimore Belt Line Tunnel.

The Belt Line Tunnel under the city of Baltimore, has been turned over to the Baltimore & Ohio Railroad. Work on the overhead structure is being pushed by the General Electric Co., which company expects to have the electrical equipment in shape by April 1. On Feb. 1 the Philadelphia and New York fast freight left Camden station about noon and with a passenger coach attached for the accommodation of a party of railroad men and others was taken through the tunnel by a steam locomotive. It is thought that the electric locomotive will be in operation in about two months.

The Jacksonville Union Station.

The new Union Passenger Station of the Jacksonville Terminal Company, at Jacksonville, Fla., was opened this week. It is near the western limits of the city, about half a mile from the old Waycross depot, and when fully completed will have cost \$500,000. It is of brick and iron. The train shed is 1,180 ft. long and 168 ft. wide. Four railroads at present have their terminals in it—the Savannah, Florida & Western; the Jacksonville, St. Augustine & Indian River; the Florida Central & Peninsula, and the Jacksonville, Tampa & Key West.

The Brooklyn Street Car Strike.

The street railroads of Brooklyn have gradually increased their forces and are now running practically all the cars needed to handle their business; and the militia have all been withdrawn from the city; but violence continued up to Tuesday of this week, and in fact, seems to have increased somewhat immediately after the military force was taken away. On Wednesday morning, the reports of the New York *Tribune* indicated that the city was nearly quiet, but the *Sun* said the mobs were violent. President Norton, of the Atlantic Avenue Railroad Company, was arrested on a criminal charge of running cars lettered "U. S. Mail," when, in fact, there were no mail bags on the cars; but he was let off. On Monday the strikers gathered a big crowd in front of the City Hall, claiming that they had a petition with 60,000 signatures asking the aldermen to repeal the franchises of the electric companies. The police dispersed the crowd, but the aldermen voted 10 to 8 in favor of repealing the franchises as asked for. It does not appear that this action will have any important effect. Collisions of cars with each other and with wagons are reported every day.

LOCOMOTIVE BUILDING.

A report is about that the Boston & Maine Railroad will soon order new locomotives in addition to the new car equipment already noted. The number of engines to be ordered is indefinite, but will probably be 20, and it is very likely that the order will go to the Manchester Locomotive Works.

The Boston & Albany order for 20 new engines, recently given to the Schenectady Locomotive Works, as noted last week, is for 10 freight and 10 passenger engines. The passenger engines will be 8-wheelers and the freight engines of the consolidation type similar to the engines ordered from the Schenectady Works some time ago.

The Dickson Mfg. Co., of Scranton, Pa., has received an order from the Delaware & Hudson Canal Co. for three passenger locomotives.

CAR BUILDING.

Twenty new motor cars are being constructed at the Jones' Car Works, Troy, N. Y., for the Troy City Railway Company.

The Boston & Maine officers expect to order several hundred freight cars. If it is finally decided to give out the order, the number will probably not be below 400 and may be 500 or 600 cars. The order for passenger equipment has not yet been given out. The number to be ordered is 29 cars, as noted in this column some weeks ago.

BRIDGE BUILDING.

Baltimore, Md.—Preparations are being made by the Baltimore Belt Railroad to build the Barre street bridge over the cut leading to the southern entrance of the Howard street tunnel.

Benton, Me.—The Berlin Iron Bridge Co. is building a large iron highway bridge at Benton, Me. This bridge will be some 300 feet long.

Easton, Pa.—The Variety Iron Works of Cleveland, O., have been awarded the contract for building the iron bridge over the canal at this place. The price is \$4,675.

Hamilton, Ont.—The City Engineer is preparing plans for a \$200,000 steel viaduct along Cannon street in connection with the proposed railroad from Woodstock to Niagara Falls.

Iredell, Tex.—The masonry is completed and the bridge is en route from the shops for the Texas Central Railroad Co.'s bridge across Duffau Creek near Iredell on that road. This is a 150 ft. skew span, the angle being 45 degrees with the railroad. The bridge was built by the Union Bridge Co., and will be erected by the railroad company under the direction of Mr. William T. Gould, Resident Engineer.

Nashville, Tenn.—The Senate has passed the bill authorizing Perry County to issue \$15,000 worth of bonds to build bridges across Buffalo River.

Piedmont, W. Va.—A joint meeting of the County Commissioners of Mineral county, W. Va., and Alleghany county, Maryland, was held in Piedmont last week for the purpose of accepting from the contractors a new steel bridge across the Potomac River between this city and Luke, Maryland. The bridge was built by the Youngstown Bridge Company, of Youngstown, O. It has three spans and is a very handsome structure.

Port Huron, Mich.—Bids for the proposed new bridge across Black River at Tenth street were opened by the city authorities last week. Plans were submitted by 20 concerns, embracing 30 separate propositions. The bids ranged from \$14,727 to \$24,608.

Portland, Mich.—The Michigan Bridge Co., of Portland, has been incorporated in Michigan, with Samuel S. Ramsey, Alonzo Belis, Claude L. Ramsey and others as incorporators.

Steubenville, O.—Joseph Basler, of Steubenville, O., has taken options on all property for a landing for a highway bridge over the Ohio River. The bridge is to be a highway structure, of five spans. Who the projectors of the bridge are is not made public, but Mr. Basler says

the plans are being prepared and the projectors will be ready to go on with the work in the spring.

Syracuse, N. Y.—The construction of a canal bridge at Salina street, also bridges at Clinton street and Geddes street, Syracuse, is authorized by a bill passed last week by the New York legislature.

Utica, N. Y.—A bill appropriating \$18,000 for the construction of a lift-bridge over the canal at Genesee street in Utica has been introduced in the New York Legislature.

Tacoma, Wash.—The driving of the piles for the eastern approach to the Eleventh street bridge has commenced, and the building of the bridge proper will be begun immediately.

Toledo, O.—The contract for building the bridge over Swan Creek at Perry Street has been awarded to the Toledo Bridge Co. for \$26,000.

Washburn, Ont.—Mr. Job Abbott is preparing plans for a steel bridge at this place. The cost of the bridge with stone foundations is estimated at about \$30,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Rhode Island it is held that an order by a town council requiring a railroad company to keep a flagman at a crossing without specifying any time for so doing requires a flagman by night as well as by day, if trains are then liable to pass.¹

In Indiana plaintiff made an agreement with a railroad whereby, in consideration of the grant of certain right of way upon which to build certain spur tracks and the exclusive use of a track belonging to him in connection therewith, it was to give him special freight rates. Thereafter a mortgage on the railroad was foreclosed and the decree provided that the purchasers of the railroad might disclaim the agreement in question, which they did, and their disclaimer was approved by the court. The Appellate Court held that defendant, claiming through such purchasers, was not bound by the agreement.²

In Missouri a railroad issued to plaintiff a perpetual pass over its road in consideration of right of way given it through plaintiff's land. Subsequently the defendant purchased the above road without assuming any of its debts or obligations and did not use the right of way. The Supreme Court rules that defendant was not bound to honor plaintiff's pass.³

In the Federal Court it is ruled that on the sale of a railroad on foreclosure, it is error to direct payment of claims for supplies furnished prior to the receivership out of the purchase money, where no provision was made for such payment when the receiver was appointed, and there is no evidence that current earnings, before or after his appointment, were diverted to paying interest on the bonded debt.⁴

In Arkansas the Supreme Court holds that in a suit to forfeit donation to a railroad company made on condition that it maintain depot on land donated, proof that depot was removed after 11 years and that such removal rendered adjacent lots less valuable for hotel purposes, will not sustain a finding for plaintiffs.⁵

In Iowa in an action by a railroad to enjoin another railroad company from constructing a grade-crossing at a certain place, it appeared that plaintiff's business at such place required the running of numerous trains daily, that there are up and down grades near the proposed crossing, that it would cause plaintiff great inconvenience and expense to require it to stop its trains for the crossing, and that an over-crossing was impracticable. The Supreme Court holds that an order requiring defendant to construct an under-crossing was proper.⁶

In the Federal Court it is held that a railroad mortgage covering "all the corporate rights, privileges, franchises, and immunities, and all things in action, contracts, claims, and demands of the said party of the first part, whether now owned or hereafter acquired in connection or relating to said railroad," is sufficient to include a subsequently acquired lease of a belt railroad whereby the company acquired access to a city at one of its terminals.⁷

Injuries to Passengers, Employees and Strangers.

The Supreme Court of New York holds that an assent by a passenger to a limitation of the carrier's liability will not be implied when such limitation is communicated to him for the first time, after he has paid his fare and is in a situation by the act of the carrier which does not admit of his declining the conveyance and reclaiming his baggage.⁸

In Texas it is laid down that the slightest negligence against which human prudence, diligence, and skill can reasonably guard will render a railroad company liable for injuries to its passengers.⁹

In West Virginia it is held that in an action against a railroad by a passenger for injuries resulting from an obstruction of the track by work being done thereon it is no defense that defendant had placed the work in the hands of an independent contractor and that his negligence caused the obstruction.¹⁰

The Supreme Court of Pennsylvania rules that the presence of a screw-eye on the inner side of the door about five feet from the bottom and projecting nine-sixteenths of an inch and used to hold back the door, is not evidence of negligence in the construction of the door, though the passenger was injured by contact with the eye.¹¹

In the same State it is ruled that a carrier is not responsible for injuries to a passenger resulting from the act of an intending passenger, who, being about to pass through a car door, pushed it open violently causing it to injure the passenger.¹²

In Indiana a train on which plaintiff's decedent was engineer was entering a yard in which decedent's company and defendant company had equal rights to the track. On seeing defendant's train backing towards him decedent signaled and both engines were reversed. Owing to the breaking of a drawbar pin seven cars broke from defendant's train and ran into decedent's train, and killed him. If the pin had not broken, defendant's train would have been stopped in time to avoid the collision, but the pin was not defective, and its breaking was an inevitable accident. The servants of the two companies usually relied for protection on keeping a sharp lookout, which was done in this case, but, owing to a curve, the approaching trains could not be seen till they were too near to avoid collision, in view of the breaking of the pin. The Supreme Court rules that defendant was negligent, but that decedent was guilty of contributory negligence, since both neglected to take precautions to avoid dangers liable to be encountered in rounding the curve, and this negligence concurred with and induced the breaking of the pin.¹³

In Arkansas the Supreme Court holds that after the name of a station has been called and the train brought to a standstill a passenger is entitled to assume that the company will not expose him to unnecessary danger; and his failure to discover an approaching train on an intervening track while on his way to the depot is not con-

tributory negligence, as a matter of law, where the night was dark, and no signals were given, but the question is for the jury.¹⁴

In a case in the Supreme Court of the United States a locomotive engineer who had reported the dangerous condition of the pilot plow of his engine to the officers whose duty it was to make repairs, under circumstances giving him the impression that the defect would be remedied, was called upon two weeks afterwards, during which time he had been absent, to take charge of the engine at night in a roundhouse so full of steam as to prevent a critical examination of it. The court rules that his taking it out under the circumstances did not imply an assumption of the risk resulting from its dangerous condition.¹⁵

In Texas it is held that a railroad is liable for injuries received by a section hand caused by the breaking of the brake rod of a hand car through a defect which could have been discovered by proper inspection.¹⁶

In Missouri it is laid down that where defendant's baggage man—whose authority as such agent was merely to carry the baggage of passengers and property of defendant—was, by arrangement with plaintiff, in the habit of gratuitously carrying drills for the lime company of which plaintiff was foreman and throwing them out of the baggage car near the lime quarry, and it was not known by defendant's officers that he was carrying them as its agent, it is not liable for an injury to plaintiff who was struck by the drills as they were thrown from the car by the baggage man.¹⁷

In Texas it is laid down that the law presumes that a person walking on a railroad track will leave the same in time to prevent injury from an approaching train of which he has knowledge, or should have, by the ordinary use of his senses; and the managers of the train may act on this presumption.¹⁸

- ¹ Wilson vs. N. Y., N. H. & H., 29 Atl. Rep., 300.
- ² C. & E. vs. Towle, 37 N. E. Rep., 358.
- ³ Dickey vs. K. City & I. R. T. Ry., 26 S. W. Rep., 685.
- ⁴ Cutting vs. T. O. & A., 61 Fed. Rep., 150.
- ⁵ L. R. & F. S. vs. Birnie, 26 S. W. Rep., 528.
- ⁶ C. B. & Q. vs. C. P. M. & D. M., 58 N. W. Rep., 918.
- ⁷ Columbia F. & T. Co. vs. K. U. Ry., 60 Fed. Rep., 794.
- ⁸ Lechowitz vs. H. Packet Co., 28 N. Y. S., 577.
- ⁹ S. A. & A. P. vs. Long, 26 S. W. Rep., 114.
- ¹⁰ Carrico vs. W. V. C. & P., 19 S. E. Rep., 571.
- ¹¹ Graeff vs. P. & R., 28 Atl. Rep., 1107.
- ¹² Graeff vs. P. & R., 78 Atl. Rep., 1107.
- ¹³ E. & T. H. vs. Krapf, 36 N. E. Rep., 901.
- ¹⁴ St. Louis S. W. vs. Johnson, 26 S. W. Rep., 593.
- ¹⁵ N. P. vs. Babcock, 14 S. Ct., 978.
- ¹⁶ C. H. & S. A. vs. Edmunds, 26 S. W. Rep., 632.
- ¹⁷ Walker vs. H. & St. J., 26 S. W. Rep., 360.
- ¹⁸ S. L. & S. F. vs. Herrin, 26 S. W. Rep., 425.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

St. Paul & Duluth, 2½ per cent. on the preferred stock, payable March 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Barclay**, annual, Philadelphia, Pa., Feb. 11.
- Cumberland Railway & Coal Co.**, annual, Montreal, Feb. 13.
- Kingston & Pembroke**, annual, Kingston, Feb. 13.
- Missouri, Kansas & Texas**, special, Parsons, Kansas, Feb. 14, to ratify the lease of the Southwestern Mineral.
- Missouri Pacific**, annual, St. Louis, Mo., March 12.
- Montreal & Atlantic**, special, Montreal, Feb. 11.
- Peoria & Eastern**, annual, Danville, Ill., Feb. 13.
- Philadelphia & Erie**, annual, Philadelphia, Pa., Feb. 11.
- St. Louis, Iron Mountain & Southern**, annual, St. Louis, Mo., Mar. 12.
- Summit Branch**, annual, Philadelphia, Pa., Feb. 12.
- Wheeling & Lake Erie**, annual, Toledo, O., Feb. 12.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The **Freight Claim Association** will hold its annual meeting in Chicago on March 13. The headquarters will be at the Auditorium. The Secretary is S. A. Mehorter, of Philadelphia.

The **Western Railway Club** meets in Chicago on the third Tuesday of each month.

The **New York Railroad Club** meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The **New England Railroad Club** meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The **Central Railway Club** meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m.

The **Southern and Southwestern Railway Club** meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The **Northwestern Railroad Club** meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The **Northwestern Track and Bridge Association** meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The **American Society of Civil Engineers** meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The **Western Society of Engineers** meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

The **Engineers' Club of Philadelphia** meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The **Boston Society of Civil Engineers** meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The **Engineers' Club of St. Louis** meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The **Engineering Association of the South** meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The **Engineers' Society of Western Pennsylvania** meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The **Technical Society of the Pacific Coast** meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The **Association of Engineers of Virginia** holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The **Denver Society of Civil Engineers** meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The **Montana Society of Civil Engineers** meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The **Engineers' Club of Minneapolis** meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The **Canadian Society of Civil Engineers** meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The **Civil Engineers' Club of Cleveland** meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The **Engineers' Club of Cincinnati** meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The **Engineers' and Architects' Club of Louisville** meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month, at 8 p. m.

The **Foundrymen's Association** meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

The **Western Foundrymen's Association** meets in room 701, Western Union Building, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The **Association of Civil Engineers of Cornell University** meets on Friday of each week at 2.30 p. m., from October to May inclusive, at their Association Rooms in Lincoln Hall, Ithaca, N. Y.

American Institute of Electrical Engineers.

On account of the conflicting dates with the Convention of the National Electric Light Association at Cleveland, Feb. 19, 20 and 21, the regular monthly meetings of the Institute at New York and Chicago have been postponed from Feb. 20 to Wednesday, Feb. 27, 1895. The paper to be presented on the latter date is by Mr. H. Ward Leonard, entitled "Notes on Recent Electrical Engineering Developments in France and England," being the results of the author's recent personal observations in electric light, railroad, central station and underground practice.

Western Society of Engineers.

The following officers were elected at the annual meeting held Jan. 2: President, Horace E. Horton; Vice-Presidents, L. P. Morehouse and Thomas T. Johnston; Secretary and Librarian, Charles J. Roney; Treasurer, David L. Barnes; Trustee, C. A. M. Liljencrantz. The annual reports gives the present membership as 416, a net gain of 78 during the year. The library has nearly doubled in number of volumes during the past year and is now being catalogued and made accessible to the members. The financial statement for the year shows total receipts \$4,777; total disbursements, \$4,363, leaving a cash balance of \$414 and no liabilities. The society has removed its headquarters to rooms 1736-39 Monadnock Block, Chicago.

At the meeting on Feb. 6, held at the Armour Institute, Chicago, papers on the construction of the Brighton and Summit Divisions of the Chicago Sanitary District Canal were read by Messrs. A. E. Kastl and E. R. Shnable, Division Engineers.

The Southern & Southwestern Railway Club.

The next meeting of the Southern & Southwestern Railway Club will take place at the Kimball House, Atlanta, Ga., on April 18, at 10 o'clock a. m. The subjects for discussion will be: (1) "Revision of Master Car Builders' Rules of Interchange," Mr. R. D. Wade, S. M. P. Southern Railway Co., Washington, D. C., Chairman of Committee; (2) "What is the Cause of Uneven Wear of Driving Wheel Tires running in the Southwestern Territory?" Messrs. W. Rutherford, P. H. Schriber, W. H. Hudson, special committee; (3) "What is the Most Economical Method of Obtaining Compressed Air for General Use in Railroad Shops and its Application?" Messrs. T. W. Gentry, John S. Cook, W. F. Brodnax, W. J. Hartman, special committee; (4) Discussion of the Report on Counter-Balancing of Driving Wheels; (5) Additional Report of Committee on Draft Sheets and Discussion of the Subject; (6) "What is the Most Economical Tonnage Spring: The Elliptic, Half-Elliptic, or the Coil, considering the first cost, and the duration of efficiency of each, and its effect on the Rolling Stock and Track?" Messrs. R. P. C. Sanderson, Geo. W. Morris, S. A. Charpiot, special committee.

American Society of Civil Engineers.

At the regular meeting of the Board of Direction, Feb. 5, Mr. Charles Warren Hunt, was elected Secretary of the society.

At the meeting of the society Feb. 6, a paper by Mr. W. H. Hall was presented on the Santa Anna Canal of the Bear Valley Irrigation Company.

Association of Engineers of Virginia.

The annual meeting of the association was held Jan. 26, 1895, the President, Mr. Charles S. Churchill, in the chair. The directors reported 34 active members and two honorary members. The year 1894 has been a memorable one in the history of the association, having been witness to the scattering of its members to all parts of the country to meet the requirements of their profession. The association is out of debt. There is \$158 in the treasury to meet all expenses during the year 1895. The association has become a member of the "Association of Engineering Societies." During the year 1894 three regular meetings and six monthly informal meetings were held, during which twelve topics were discussed and six papers were read and referred to the Committee on Publication. The summer meeting at Alleghany Springs was regarded by all a success. The building laws compiled by the association were adopted by the city of Roanoke. The association took an active part in presenting a form of road law before the State legislature, and considerable expenditure was made by the association and by its individual members to secure action at an early date. The election of officers for the year 1895 resulted as follows: President, J. C. Rawn; Vice-President, M. E. Yeatman (to serve two years); Secretary, John A. Pilcher; Treasurer, J. R. Schick; Directors (to serve three years), C. S. Churchill, L. L. Randolph and H. C. Macklin. Mr. C. S. Churchill was elected as the representative of the Association of Engineers of Virginia on the Board of Management of the "Association of Engineering Societies." A paper by Mr. J. E. M. Hancle, entitled "Road Improvements in Knox County, Tennessee, and Fulton County, Georgia," was read and after discussion referred to the Publication Committee. This paper re-enforced the

arguments brought out before in the association for the adoption by the State of Virginia of the Road law as proposed by the Association of Engineers of Virginia, and showed that convict labor can be most successfully employed on this class of public improvements.

Engineers' Club of St. Louis.

The club met Jan. 16, Vice-President Ockerson, in the chair, 21 members and seven visitors present. The committee submitted the following program of papers and addresses for the year 1895:

Jan. 2, Chimney Draft, E. D. Meier; Jan. 16, River Surveys by the Transit and Stadia, J. L. Van Ornum; Feb. 6, Discussion of B. L. Crosby's paper on the St. Louis Extension of the St. L., K. & N. W. R. R. A System of Removing Organisms from Liquids, J. H. Curtis; Feb. 20, The Mechanics of Soaring Flight (a translation), E. D. Meier; March 6, Timber Physics, J. B. Johnson; March 20, European Engineering Schools, W. S. Chaplin; April 3, Methods of Determining the Heating Power of Coals, J. H. Kinealy; April 17, Vitified Brick for Street Paving, H. A. Wheeler; May 1, The Design of the Train House of the New Union Station at St. Louis, G. H. Pegram; May 15, An Experimental Investigation of the Three Moment Theorem, M. A. Howe; June 5, Water Towers at Laredo, Tex., and St. Charles, Mo., Edw. Flad; Sept. 18, Maintenance of Bridges, C. Gayler; Oct. 2, The Continuous Rail in Street Railway Service, R. McCulloch; Oct. 16, Sewerage of Indianapolis, C. C. Brown; Nov. 6, Chimneys and Chimney Draft, W. E. Worthen; Nov. 20, Report of Committee on Smoke Prevention; Dec. 4, Annual Meeting; Dec. 18, Installation of Officers—Address of Retiring President.

The executive committee recommended to the club that Mr. Henry Flad be elected an honorary member, and on balloting Mr. Flad was unanimously elected an honorary member.

The secretary read a communication from Col. E. D. Meier, Secretary of the American Boiler Manufacturers' Association, asking co-operation in the movement to secure legislative enactment in the direction of State boiler inspection, and licensing of engineers. On vote, it was ordered that the chair appoint a committee of three to consider the matter, and to meet a committee of the American Boiler Manufacturers' Association, the committee not to have the authority to bind the club in any way, but to report back to the club the result of its conferences and conclusions. The chair appointed on this committee Messrs. Holman, Bryan and Perkins.

Mr. J. L. Van Ornum, of the Western Society of Engineers, then read a paper on "River Surveys by the Transit and Stadia," describing a method of surveying the smaller navigable streams by the use of the stadia alone for all topographical work, as well as for the location of soundings, thus dispensing with both the triangulation system and the angular methods of locating soundings. The plan was particularly recommended where speed, low first cost, and reasonable accuracy, were desired, rather than extreme precision. The discussion was quite full, and was participated in by Messrs. Moore, Bouton, Ockerson, Butler, Jolley and Crosby.

PERSONAL.

Lieut. Robert D. Dashiell has resigned from the navy to take effect April 1, and will enter the employ of the Cramps.

Mr. J. C. Kidd, Auditor of the Houston & Texas Central Railroad, has resigned, and is succeeded by Mr. George Kidd.

Mr. Prentiss, of the Cleveland Twist Drill Co., Cleveland, O., has just started on a trip around the world and is to be absent about six months.

Mr. Perkins, President of the Avery Stamping Co., Cleveland O., has just started for a European trip and will be absent about two months.

Mr. Charles I. Sturgis has been recently appointed General Auditor of the Chicago, Burlington & Quincy Railroad. He was formerly Assistant General Auditor of the railroad, but for some time past has been Acting General Auditor.

Mr. A. G. Sinclair, late President of the New York Emery Co., has connected himself with the Tanite Co., of Stroudsburg, Pa. Mr. Sinclair is one of the oldest salesmen in the emery trade, and also a practical manufacturer of emery.

Mr. William G. Christian, of Lebanon, Pa., formerly supervisor on the Lebanon Valley and East Penn branches of the Philadelphia & Reading, and lately with the South Jersey Railroad, has been appointed supervisor of the North Penn branch of the Reading.

Colonel Benjamin F. Northcott, prominent in Missouri, died at Linneus, Mo., last week, aged 77 years. He was for some years President of the old Burlington & Southwestern Railroad, now part of the Burlington lines and a prominent lawyer and editor.

Messrs. James M. Simpson, Joseph L. Lowe and Samuel T. Howe, have been elected Railroad Commissioners of Kansas by the Executive Council for terms of three years, two years, and one year respectively. Two of the new members are Republicans, and the third is a Democrat.

Mr. George L. Rhodes, who recently resigned as Assistant General Passenger Agent of the Chicago, Rock Island & Pacific, has been appointed General Agent of the roads composing the Seaboard Air Line, of which Mr. E. St. John, is Vice-President. His headquarters will be at Portsmouth, Va.

Mr. C. L. Davidson has been recently appointed a member of the Board of State Railroad Commissioners of Iowa, succeeding Mr. Peter A. Dey. The Board of Commissioners now consists of John W. Luke, George W. Perkins and C. L. Davidson. The Secretary is W. W. Ainsworth, of Des Moines, who has held that office for very many years.

Mr. W. B. Ott, formerly Assistant Engineer on the Philadelphia & Reading, at Philadelphia, and from there transferred to the Shamokin Division, and subsequently appointed Assistant Engineer of the Philadelphia, Reading & New England railroad, with headquarters at Hartford, has been appointed Assistant Roadmaster of the latter road with an office at West Winsted, Conn.

Mr. E. E. Davis, whose appointment as Assistant Superintendent of Motive Power of the Philadelphia & Reading Railroad was noted in these columns three weeks ago, assumed the duties of his new position on Feb. 1. As already stated, he has been Superintendent of the Boies Steel Wheel Co., at Scranton, for some time past, but before that was in railroad service with the Boston & Maine and other companies.

Mr. Robert Dover, night watchman at a factory in Ansonia, Conn., has received the gift of a gold watch from the New York, New Haven & Hartford Railroad in recognition of his "thoughtful kindness" in notifying the railroad company of a canal washout which threatened to do great damage to the tracks on Nov. 3. The watch was

presented to Mr. Dover by Superintendent G. W. Beach, of the Naugatuck Division.

Mr. James M. Phillips, who was General Superintendent of the Kentucky Union Railroad until a few months ago, died suddenly in Dallas, Tex., this week. He was about 50 years old, and had been in railroad service a great many years. Before going to the Kentucky Union, about four years ago, he was General Superintendent of the Gulf, Colorado & Santa Fe, and most of his railroad service had been in Western States.

Mr. A. Dolbeer, just appointed Superintendent of the Boies Steel Car Wheel Works at Scranton, Pa., is well-known throughout this country as a railroad mechanical officer. He has recently been with the Florida Central & Peninsula Railroad, but was formerly Master Mechanic of the Lehigh Valley Railroad at Buffalo when that road was leased to the Philadelphia & Reading. He was previously for some years Superintendent of Motive Power and Machinery on the Buffalo, Rochester & Pittsburg.

Hon. Joseph A. Linscott, who died at Farmington, Me., last week, was prominent in political life and had held important railroad offices. He was elected Treasurer of the Androscoggin Railroad in 1859, holding the office until the road was leased to the Maine Central in 1871; then he removed to Portland and became Auditor for the latter railroad. Eight years later he was chosen Treasurer, and he held that office till in 1892, when he resigned on account of failing health.

Mr. Bradford L. Gilbert's comely form is quite satisfactorily shown by an engraving in the current number of the *Review of Reviews*, the occasion being his appointment as Supervising Architect of the Cotton States & International Exposition to be held at Atlanta. Mr. Gilbert has designed and supervised a large proportion of the important railroad stations recently built in New England, the West, South and Mexico, and it is probably true that he has had charge of more of that branch of professional work than any other living architect.

Mr. John A. Smith has been appointed commissioner of the freight bureau recently established at Charleston, S. C., by the merchants of that city. This bureau, it will be remembered, is largely supported by the city, the City Council having made an appropriation of \$8,000 for the first year. Mr. Smith comes from New Orleans. He has served in the Freight Department of the Missouri, Kansas & Texas several years, having begun as Station Agent at Waco, Tex. He was promoted through several grades and his last position was General Freight Agent of the lines in Texas.

Mr. Walter C. Quincy died at the Homeopathic Hospital, Pittsburg, Sunday night last, of nervous prostration, after an illness of several months. He was born in Baltimore 64 years ago and had been identified with the railroad business all his life. He was connected with the Baltimore & Ohio Railroad for over 30 years until 1878. In that year he went from Newark, O., to Pittsburg. About that time he entered the service of the Pittsburg & Lake Erie Road, and was one of the managers of it for a number of years. From that road he went to the Monongahela Connecting Railroad as General Manager, continuing in that capacity until his death.

ELECTIONS AND APPOINTMENTS.

Atlanta & Florida.—The present officers of this company are: William B. Thomas, Receiver and General Manager; R. T. Dow, Auditor, and T. C. McLendon, Master of Transportation. The general offices of the company are at Atlanta, Ga.

Atlantic & Danville.—The principal office of this company has been formally removed from Portsmouth to West Norfolk, Va.

Baltimore Cumberland.—At a meeting of directors of the company this week Thomas B. Davis was re-elected President and C. M. Hendle, Secretary and Treasurer.

Chicago & Southeastern.—J. T. Dickey has been appointed Car Accountant to succeed C. S. Parkhurst.

Chicago Great Western.—E. S. Hitchins, having resigned to take service with another company, the office of freight claim agent has been abolished and the duties assumed by the Freight Auditor, Frank Hoppe, to whom all correspondence relating to freight claims will be addressed.

Clendenin & Spencer.—The officers of this company are: W. S. Lewis, President, with office at Charleston, W. Va.; E. H. Shelley, Vice-President, with office at 12 Broadway, New York City, and J. O. Jackson, Secretary and Treasurer. The general offices are at Charleston, W. Va.

East Louisiana.—Gorman S. Orme has been elected Secretary to succeed W. J. Poitevent.

Findlay, Fort Wayne & Western.—Philip Kissam has been elected President; John Jacob Astor, Vice-President, and Henry B. Ely, Treasurer, all with offices at 23 West Twenty-sixth street, New York City. C. M. Bissell is General Manager, with headquarters at Findlay, O.

Great Northern.—C. J. Brooks, now City Passenger and Ticket Agent of the Chicago Great Western at Des Moines, has been made Northern Passenger Agent of the Great Northern at Duluth. General Agent Robinson, at St. Paul, and Contracting Agent J. R. Charler, of Cleveland, have resigned.

Lake Shore & Michigan Southern.—H. Bromley, formerly General Agent, has been appointed Division Freight Agent, with headquarters at Cleveland, O. He will have jurisdiction over ore, coal and such other special traffic as may from time to time be assigned to him.

Lawrens.—A. C. Haskell is Receiver of this company, with office at Columbia, S. C.

Louisville, St. Louis & Texas.—George H. Lamkin, in addition to his duties as Auditor, has been elected Secretary, with headquarters at Louisville, Ky.

Minneapolis, St. Paul & Ashland.—The directors of this company, recently organized in Wisconsin, are: Thomas Bardon, Edwin Ellis, J. E. Cochran, E. A. Shares, W. R. Sutherland, Samuel S. Fifield, David Mowatt, Ashland; R. L. McCormick, Hayward; C. H. Pratt, C. D. McMillan, S. G. Cook, Minneapolis; A. R. McMill, St. Paul; W. W. Peity, St. Croix Falls. The officers are: J. E. Cochran, President; Charles H. Pratt, Secretary, and S. S. Ellis, Treasurer.

Pittsburg, Chartiers & Youghiogheny.—The following officers have been elected at the annual meeting: J. H. Reed, President; John G. Robinson, Vice-President; R. T. Hill, Secretary and Accountant; T. H. B. McKnight, Treasurer, all with office at Pittsburg, Pa. James B. Safford continues as Superintendent, with headquarters at McKees' Rock, Pa.

Selmer & Tennessee River Valley.—The names and addresses of this new Tennessee company are: F. L. Bates, President, Memphis, Tenn.; Col. J. W. Purviance, Vice-President, Selmer, Tenn.; J. B. Jopling, Secretary, Selmer; P. H. Thrasher, General Manager, Selmer, and E. S. Cheatham, Chief Engineer, Memphis, Tenn.

Surawnee River.—The present officers of this company are: Edward J. Carter, President; W. R. Busenbark, Vice-President; Charles A. Baldwin, Secretary and Treasurer, all with office at 40 Wall street, New York City. James Veit, General Superintendent and General Freight and Passenger Agent, with office at Jacksonville, Fla. Charles F. Von Ebner, Auditor, and A. R. Baldwin, Land Commissioner, both with office at 40 Wall street, New York City.

Wichita & Western.—John H. McEntire, Receiver for the Wichita & Western, and H. P. Dillon, Receiver for the Manhattan, Alma & Burlingame, have appointed officers for the receiverships as follows: Treasurer, E. Wilder; Auditor, J. F. H. McKibben; Assistant General Passenger Agent, W. J. Black; Assistant General Freight Agent, C. R. Hudson; Superintendent of the M. A. & B., C. T. McLellan, Topeka.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Alexander Lumber Co.—Joseph Fucy, who has the contract for extending the railroad of the Alexander Lumber Co. from its present terminus near Huff, Randolph county, W. Va., to West Huttonsville, in the same county, has built shanties and has a big force of men ready to go to work along the entire five miles for which he has the contract. J. E. Howell, has taken a contract for nine miles more of the road, and will begin work before April. The road follows the Middle Fork River from Alexander to Cassidy Creek, and up that stream to the limit of the Lumber Company's lands. The road is to develop timber land belonging to the Alexander Co., and will, at the start, haul only their product, though it is the intention to enter into other business as soon as there is demand for it.

Bellaire, Zanesville & Cincinnati.—This road is to be widened and extended to the Eastern Ohio coal fields after which it is to be operated in connection with the Columbus, Sandusky & Hocking for the shipment of coal to the lakes.

Canadian Pacific.—The Canadian Pacific has completed surveys for a branch from Robson, B. C., at the mouth of the Kootenay River to Northport, Wash., near the International boundary line.

Central of New Jersey.—The company seems to be planning to reach Hazleton, Pa. A contract between the Delaware, Susquehanna & Schuylkill Railroad is now a matter of negotiation between the officials of the two companies. The Central will build a belt line around Hazleton. An independent company will likely be organized. A survey was made from Penn Haven to Hazleton, but was not satisfactory to the engineers. It is now thought that the extension from White Haven will be the easiest route.

Columbus, Hocking Valley & Athens.—The condemnation of property along the route of this road is progressing. The road is to extend from Columbus along the Hocking Canal to Athens, O., 75 miles, and will be a rival to the Columbus, Hocking Valley & Toledo for coal traffic from the Hocking Valley.

Dominion Coal Co.—The railroad which this company is building from Sydney to Louisburg, Nova Scotia, about 20 miles, is expected to be ready for operation by May 1.

Florence Southern.—A meeting of the directors was held in Florence, Col., on Jan. 28. W. E. Johnson, of Florence, was elected President; Hon. Hosea Townsend, of Silver Cliff, Vice-President; W. Kopfer, Secretary, and James A. McCandless, Treasurer. The board voted to put engineers in the field at once and to make the final locating survey, cross-section and prepare estimates of cost.

Irondale, Bancroft & Ottawa.—The company has made an application to the Ontario Legislature for an act extending the time for the completion of the road and authorizing an extension from a point in Hastings county to connect with the proposed bridge of the Brockville & St. Lawrence Bridge Co. at Brockville.

Manufacturers.—The Mayor of Toledo has vetoed the ordinance granting this company the right to lay tracks on Water street from Olive to Locust. The company was incorporated to build a short freight railroad to reach the factories and warehouses on this street.

New York, New England & Canada.—This company is applying for authority to build a railroad from some point on the Intercolonial near Halifax, west through the counties of Halifax, Lunenburg and Queens to Yarmouth Harbor.

New Roads.—A company composed of Mr. Englehart and John Kerr, of Petrolia, Ont., and W. D. McKee, Mr. Wilson and others, of Wallaceburg, Ont., will apply for a charter to construct a railroad between Chatham, Wallaceburg and Petrolia, about 40 miles in the Province of Ontario, Canada.

It is proposed to build a railroad from a point on the Northern railroad to pass through Durham, Wiaton and Kincardine. A charter has already been granted for a line from Wiaton to connect with the Canadian Pacific, near Chatsworth, Ontario.

The consolidated phosphate companies at Arcadia, Fla., will very likely build a railroad from Arcadia to Hull, Fla., which is about eight miles. The contract for this part of the road is let. It is expected to continue the road from there to Cleveland, where the rock can be loaded on large lighters and towed to deep water for large vessels.

Northern Pacific.—It is said that the Northern Pacific will widen the narrow gauge line to Mission, Idaho, and extend it from that point to Coeur d'Alene City, Idaho, about 20 miles.

Nova Scotia.—This company is applying for incorporation to construct a railroad from Port Maitland (or Metaghban) to a point on the Dominion Atlantic between the stations of Ohio and Metaghban, and thence to a point on the Tusket River.

Palmetto Terminal.—A company to be known under this name has been organized at Palmetto, Fla., and notice of application for charter filed. The present purpose is to build a narrow gauge road from Palmetto to the adjacent hammocks, the Ellenton and Terra-Ceja, for transporting the fruit and vegetables grown here. A sufficient amount of money has been subscribed to build and equip two miles of the road. Most of that distance is already graded.

Philadelphia & New England.—This company was organized in Milford, Pike County, Pa., last week. The directors are A. D. Brown, H. B. Wells, A. E. Lewis and J. H. Van Ritten, of Milford; Horace L. Magee, Thomas

A. Hay, James Searfass and W. H. Tinsman, of Easton; A. H. Baker, of Three Bridges, N. J.; J. R. Bennett, of Hackettstown, N. J.; Roy Stone, of Washington, D. C., and P. E. Farnum, of Port Jervis. Charles Stewart, of Easton, Pa., is President.

Rumford Falls & Rangeley Lakes.—R. B. Stratton, of Rumford Falls, Me., Chief Engineer, has begun a preliminary survey for a route towards Bemis, Me. This is an extension of the Portland & Rumford Falls road, north of Rumford Falls, Me., to Rangeley Lake.

Selmer & Tennessee River Valley.—The incorporation of this company in Tennessee was recently noted. The road, as projected, is to begin at Selmer, Tenn., terminating at Pittsburgh Landing, or the Tennessee River, a distance of 16 miles. The route is to and through the battlefield of "Pittsburgh Landing," for the purchase of which the National Government has recently made an appropriation with the view of making a National park. The survey is being pushed as rapidly as the weather will permit and will be completed within the next 30 days. The prospect for building is very good. Financial arrangements are about complete. The available capital stock consists of city of Selmer bonds, subscribed stock by local business men and by outside capitalists amply sufficient the projectors estimate to assure the construction of the road in the near future.

Springfield, Harrison & Little Rock.—The Secretary of State at Jefferson City, Mo., has issued a certificate of incorporation to this company organized to build a line from Springfield south to the State line, a distance of 60 miles, through the counties of Greene, Christian, Stone and Taney. South of the State line the route will be toward Little Rock. The incorporators are: P. B. Rogers, J. K. Jones, and T. B. Rogers, of St. Louis; W. T. Atkinson, of Philadelphia, and R. H. Laird, of London, Canada.

Toronto, Hamilton & Buffalo.—The officers of the company will apply for a Dominion subsidy of \$3,200 a mile on the entire road from Niagara Falls to Toronto. The road has not yet filed the plans showing the route proposed to be followed in coming to Toronto, but the intention is to keep to the lake side of the Grand Trunk and cross that road and the Canadian Pacific by a bridge in the vicinity of Strachan avenue. The solicitors of the company state that the road will be operated under an arrangement with the Michigan Central.

Tyler & Southeastern.—Work has been commenced on the widening of this road which is a part of the St. Louis Southwestern. It is expected that the work will be completed by July. The work is being done by convicts.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The monthly returns of earnings make the following comparisons:

	1894.	1893.	Inc. or Dec.
December.			
Gross earnings.....	\$3,558,637	\$3,686,942	D \$128,305
Oper. expenses.....	2,490,513	2,775,126	D 284,613
Net earnings.....	\$1,068,123	\$911,815	I \$156,308
ST. LOUIS & SAN FRANCISCO.			
Gross earnings.....	\$507,258	\$488,132	I \$19,126
Oper. expenses.....	291,628	348,249	D 56,621
Net earnings.....	\$215,630	\$139,882	I \$75,747
ATCHISON PROPER.			
Gross earnings.....	\$2,626,265	\$2,805,397	D \$179,132
Oper. expenses.....	1,858,362	2,036,589	D 178,227
Net earnings.....	\$767,903	\$768,807	D \$904
The earnings for the period from July 1 to Dec. 30, 1894, and the same period last year were as follows:			
Gross earnings.....	\$21,048,355	\$23,762,565	D \$2,714,209
Oper. expenses.....	15,090,972	15,667,566	D 576,593
Net earnings.....	\$5,957,383	\$8,094,999	D \$2,137,616
ST. LOUIS & SAN FRANCISCO.			
Gross earnings.....	\$3,318,879	\$3,426,154	D \$107,274
Oper. expenses.....	1,801,523	2,030,087	D 228,563
Net earnings.....	\$1,517,355	\$1,396,067	I \$121,288
ATCHISON PROPER.			
Gross earnings.....	\$15,290,685	\$18,032,406	D \$2,741,720
Oper. expenses.....	11,274,018	11,536,045	D 262,026
Net earnings.....	\$4,016,667	\$6,496,360	D \$2,479,693

Asheville & Spartanburg.—This road will be sold at Spartanburg, S. C., Feb. 15, under a decree of the United States Circuit Court, issued by Judge Simonton.

Buffalo, Rochester & Pittsburg.—The company reports the following earnings for the quarter ended Dec. 31:

	1894.	1893.	Inc. or Dec.
Gross earnings.....	\$791,545	\$807,297	D \$15,752
Oper. expenses.....	530,920	580,752	D 49,832
Net earnings.....	\$260,625	\$226,545	I \$34,080
Other income.....	11,354	10,891	I 463
Total.....	\$271,979	\$237,436	I \$34,543
Fixed charges.....	217,990	209,304	I 8,686
Surplus.....	\$53,989	\$28,132	I \$25,857

The general balance sheet shows cash on hand, \$35,195, and a profit and loss surplus of \$150,374.

Chattanooga Southern.—The sale of the railroad, which was advertised to be held at Gadsden, Ala., on Jan. 31, was postponed to Feb. 14 on motion of the Committee of Re-organization. Only one bid of \$350,000 from the Committee of Re-organization was received. As the upset figure fixed was \$500,000, there was no sale.

Chicago, Burlington & Quincy.—The earnings for December are reported in the following table:

	1894.	1893.	1892.
Gross earnings.....	\$2,460,355	\$2,896,230	\$3,544,276
Oper. expenses.....	1,391,414	1,714,285	2,215,712
Net earnings.....	\$1,068,941	\$1,181,945	\$1,328,564
Prop. expense to gross.....	564	594	624
Fixed charges.....	800,000	822,880	815,075
Surplus.....	\$268,941	\$359,065	\$513,489
For the twelve months:			
Gross earnings.....	\$31,514,877	\$38,356,483	\$40,412,402
Oper. expenses.....	19,114,307	24,502,189	26,158,977
Net earnings.....	\$12,400,570	\$13,854,294	\$14,253,405
Prop. expense to gross.....	604	634	644
Fixed charges.....	9,600,000	9,876,570	9,780,901
Surplus.....	2,800,570	3,979,724	4,472,504

Columbus & Maysville.—This road, extending from Sardinia to Hillsboro, O., has been opened for business. The road was abandoned a month ago because the traffic was not sufficient to justify its operation, but the citizens of Hillsboro have formed a local company to operate it. It will be operated in connection with the Panhandle.

Delaware & Hudson Canal Co.—The report for the year ending Dec. 31 makes the following comparisons:

	1894.	1893.	Inc. or Dec.
Receipts from coal.....	\$7,864,152	\$9,939,647	D \$2,075,495
Receipts from R.R.....	9,448,993	10,212,412	D 763,419
Miscellaneous.....	755,074	520,257	I 234,817
Total gross.....	\$18,068,220	\$20,672,317	D \$2,604,097
Oper. expenses.....	12,529,547	14,050,131	D 1,520,584
Net earnings.....	\$5,538,672	\$6,622,186	D \$1,083,514
Interest, tax, etc.....	3,319,959	3,407,637	D 87,678
Balance.....	\$2,218,713	\$3,214,548	D \$995,835
Earned on stock.....	7.1 p. c.	10 71 p. c.	

The above percentage is on \$30,000,000 of capital for nine months and \$35,000,000 for three months.

Delaware River & Lancaster.—Application has been made in the United States District Court at Philadelphia, for the appointment of a Receiver for the railroad company. The suit is brought by Henry A. V. Post and Charles C. Pomeroy, of Post, Martin & Co., N. Y. York, against the railroad company, and by Hugh M. North, of Columbia, Pa., the former trustee under its mortgage.

Illinois, Indiana & Iowa.—McIntosh Bros., the contractors who built the extension from Knox to South Bend, Ind., filed a lien on the property of that road at Milwaukee last week for the sum of \$99,000, which they claim is still due them for work on this branch as was noted in this column. President Drake of the railroad says that about \$16,000 is due the McIntoshes, but they claim a large amount for extra work performed, which Mr. Drake denies was legitimately done.

Lake Erie & Western.—The meeting of the Lake Erie & Western Railroad stockholders, to vote on the acquisition of the Indianapolis, Decatur & Western road, which was to have been held at Peoria, Ill., on Feb. 5, was postponed to Feb. 12.

Mt. Penn Gravity.—The stockholders of the company at the annual meeting of the company at Reading last week agreed to take the second mortgage bonds of the company at 75 per cent. of their face value, the payment of the coupons to be deferred for four years. The money raised will be used in discharging all the indebtedness of the company, except the first mortgage of \$40,000. The road will be operated this year as usual, the season opening about April 1.

New York Central & Hudson River.—The statement of the railroad for the quarter ending Dec. 31, 1894, has been published this week. The estimated surplus for the half year is \$22,011. The percentage of operating expenses to gross earnings was 65.2 per cent. for this quarter, against 68.5 per cent. the preceding year, and 68.18 per cent. in 1892. The following tables compare the actual results for the periods named in the last three years:

QUARTER ENDING DEC. 31.			
	1892.	1893.	1894.
Number of miles.....	2,096	2,334	2,396
Gross earnings.....	\$12,199,285	\$11,827,911	\$11,318,228
Operating expenses.....	8,317,555	8,049,330	7,378,958
Net earnings.....	\$3,881,730	\$3,778,582	\$3,939,270
First charges.....	2,455,907	2,583,770	2,627,462
Profit.....	\$1,425,823	\$1,194,812	\$1,311,807
Dividend.....	1,117,854	1,117,854	1,117,853
Surplus for quarter.....	\$307,970	\$76,957	\$118,954
HALF YEAR ENDING DEC. 31.			
Number of miles.....	2,096	2,334	2,396
Gross earnings.....	\$24,265,880	\$24,039,759	\$22,159,050
Operating expenses.....	16,716,075	16,317,419	14,933,716
Net earnings.....	\$7,549,805	\$7,722,340	\$7,665,334
First charges.....	4,964,176	5,213,618	5,257,614
Profit.....	\$2,585,629	\$2,508,722	\$2,407,718
Dividend.....	2,235,707	2,235,707	2,385,707
Surplus.....	\$349,922	\$273,015	\$22,011

Oregon Short Line & Utah Northern.—The hearing on the petition for a separate receivership for the railroad has been postponed to March 5. The time for the deposit of bonds with the committee of the consolidated mortgage and collateral trust 5 per cent. bondholders is extended to Feb. 20. This committee, of which S. Endicott Peabody is chairman, now represents more than three-fifths of the consolidated mortgage bonds outstanding.

Philadelphia & Reading.—The counsel for the trustee of the general and preference mortgages has completed the legal papers necessary for the institution of foreclosure proceedings and will file the bill in the United States Circuit Court next week. The last day for depositing securities with the Re-organization Committee was Jan. 31. The committee has as yet taken no steps toward the formation of a new re-organization plan, and it is likely will not do so for some time to come.

The earnings of the railroad company are reported below for December:

	1894.	1893.	1892.
Gross earnings.....	\$1,551,928	\$1,752,511	\$1,968,367
Oper. expenses.....	947,066	922,284	1,092,523
Net earnings.....	\$604,861	\$730,227	\$875,844
Prop. expense to gross.....	61	554	554
Total net earnings.....	677,803	840,015	909,364
Equipment payments.....	92,810	126,661	188,076
Terminal.....	50,000	50,000	
City improvements.....	358	27,186	

COAL & IRON COMPANY.

	1894.	1893.	1892.
Receipts.....	\$1,588,255	\$2,279,310	\$1,705,345
Oper. expenses.....	1,738,204	1,983,855	1,645,781
Deficit.....	\$293,428	Sur. \$9,132	Def. \$119,578
Fixed charges.....	705,000	704,470	718,679
Total charges.....	\$889,281	\$908,317	\$906,755
Total deficit.....	211,477	68,301	2,609

Western New York & Pennsylvania.—The entire property of this railroad was sold at Pittsburg on Feb. 5 under the terms of the second mortgage bonds. The plan of readjustment contemplates retiring all the junior debentures, giving in their stead \$10,000,000 of new bonds with graduated interest coupons, running from 2 to 4 per cent. By this means the fixed charges will be reduced one-half. It was possible for the company to pay the interest on a funded debt of \$38,000,000, but reducing these fixed charges will make it possible for the road to possibly yield something for the original investors. The money paid in by the shareholders will provide enough to turn over the property. The management will remain the same, and S. G. De Courcy, who has been the Receiver, will be made President and General Manager.

Winona & Southwestern.—It is stated that the Winona & Southwestern has been sold to the Chicago & Northwestern and that the road will be extended from Osage to Mason City, Ia.

TRAFFIC.

Traffic Notes.

Shipments of coke during the month of January from the Connellsville region were very heavy, averaging over 8,000 cars a week.

The Cape Fear & Yadkin Valley railroad is building a wharf at Wilmington, N. C., at which it expects to deliver to vessels a good deal of coal from the mines at Chatham, N. C., 120 miles from Wilmington.

The Texas Car Service Association is to establish weighing and inspection bureaus at the principal points in its territory. The recently published statement that weighers have been discharged, seems to have referred only to cotton shipping stations.

The cases of Mr. Milton Knight and others who were indicted four years ago for violating the Interstate commerce law, in making rebates on flour shipped eastward from St. Louis, came up for trial in the United States District court at St. Louis, Feb. 4.

It is reported that the New England roads have agreed to abolish differential freight rates to points in the West, and that the strong lines have made some sort of an agreement to let the weak lines have a fair share of the business. On the same day it was reported that the Kanawha Despatch and other Southern lines had made a cut in some commodity rates from Boston.

Twenty carloads of free supplies for destitute people in Nebraska were sent from New Orleans and vicinity on Jan. 26 over the Illinois Central, the Kansas City, Fort Scott & Memphis and the Missouri Pacific. Most of this freight was food, including 600 barrels of molasses. There was one car of lumber and one of salt. A railroad officer in Illinois, on asking why the Burlington would no longer take supplies to Nebraska free, was answered as follows: "This was done on request of the Nebraska relief commission, who advise that they have more supplies on hand than they can distribute in six months. We have been hauling since about the 1st of December on an average about 500 tons a week free to Nebraska, and we think it is about time to stop it. Other roads have taken the same course." It appears that there has been some bad management in the distribution of supplies, and reliable citizens of Nebraska have stated that charitable aid is no longer needed.

Chicago Traffic Matters.

CHICAGO, Feb. 6, 1895.

The new Western transcontinental passenger agreement is apparently an assured success. The Union Pacific has agreed to become a member of the committee, the other lines consenting to allow it to publish its rates to Puget Sound territory in individual rate sheets, but not including them in the association issue. This is satisfactory to the Northern Pacific, and it is probable that the trouble about the Denver and Oregon gateways will be amicably adjusted between the Burlington, the Rock Island and the Union Pacific.

The passenger representatives of the Central Traffic lines are in session to-day considering, among other matters, the question of the abolishing of all stop-over privileges.

The Chicago & Eastern Illinois has given notice that rates on soft coal from the Indiana mines will be restored to the former basis as soon as can be legally done. Thus endeth the coal war. Coal has been selling in Chicago at \$2 a ton.

The new transcontinental freight rates apply to commodities only, all commodity rates from New York, Chicago and Missouri River to California coast points that have been less than 50 cents per 100 lbs., having been advanced to this figure. The Western roads have agreed to accept a minimum through rate from Central Traffic Association territory to same points on same commodities of 75 cents per 100 lbs.

Traffic Item From Down East.

Deer, caribou and moose, shipped from stations on the Bangor & Aroostook Railroad during October and November, 1894.

From	Deer	Caribou	Moose.
South La Grange.....	2		
La Grange.....	5		1
Milo.....	23		1
Brownville.....	15		1
Schoodic.....	52	1	1
West Seboeis.....	4		1
Norcross.....	338	5	4
Millinocket.....	14	1	4
Grindstone.....	43		2
Stacyville.....	23		
Sherman.....	24	2	2
Crystal.....	22		
Island Falls.....	16	2	1
Oakfield.....	8	7	1
New Limerick.....	1		
Sebec.....	2		
Blanchard.....	2	1	
Shirley.....	4		
Greenville.....	136	2	10
Brownville Junction.....	4		
Katahdin Iron Works.....	73		6
Houlton.....	6	1	1
Total.....	817	24	37

Passengers from Europe in 1894.

Landing Agent John E. Moore has prepared the following table showing the number of steerage passengers landed at Ellis Island, New York harbor, during the year 1894, also the number of cabin passengers landed at the port of New York:

Name of Steamship Line.	Where from.	Cabin.	Steer.
White Star Line.....	Liverpool.....	11,520	20,898
North German Lloyd.....	Bremen.....	2,049	19,927
Cunard line.....	Liverpool.....	18,362	19,175
Hamburg-American Packet Co.....	Hamburg.....	9,594	18,463
American line.....	Southampton.....	13,560	15,905
North German Lloyd.....	Mediterranean.....	1,840	13,086
Netherlands American Steam Nav. Co.....	Rotterdam.....	3,316	9,638
General Transatlantic Co.....	Havre.....	7,490	9,589
Red Star line.....	Antwerp.....	4,513	8,609
Scandia line.....	Stettin.....	69	7,608
Hamburg-American Packet Co.....	Mediterranean.....	643	7,129
Anchor line.....	Glasgow.....	5,703	6,437
Roland line.....	Bremen.....	108	5,916
Anchor line.....	Mediterranean.....	20	5,223
Fabre line.....	Mediterranean.....	6	4,395
Thingvalia line.....	Copenhagen.....	635	3,799
Union line.....	Hamburg.....		3,236
Allan-State line.....	Glasgow.....	2,322	2,909
Florio Ruhatino line.....	Mediterranean.....	34	1,509
Netherlands American Steam Nav. Co.....	Amsterdam.....		1,339
Compagnie Nationale de Navigation.....	Mediterranean.....	3	1,421
Guion line.....	Liverpool.....	336	264
Miscellaneous.....		438	1,584
Total.....		92,561	188,164